Vulgar Arithmetique,

EXPLAYNING

the Secrets of that

ART,

After a more exact and easie way than ever.

Peculiarly fitted for Merchants and Tradesmen, made usefull for all Men familiar to the meanest Capacity; and, for the publique good, layd down in a School Method.

In some parts collected, amended, augmented, and in severall parts devised.

To which are added variety of choyce and usefull Questions, with their Answers, exercising the respective Rules in the severall Chapters of this Treatise.

By NOAH BRIDGES ——

Printed for the Author, and are to be sold by *A. Crook* at the *Green Dragon* in S. *Paul's* Church yard, and *H. Tucky* at the *Black Spread-Eagle* against St. *Dunstans* Church in *Fleet street.*

Faithorne (with Nature at a Noble-strife)
Hath paid ye Author a great share of Life:
Yet the Proportions, which doe make him looke
Most like Himselfe, are those within ye Booke.

G. W:

MVSEVM
BRITAN
NICVM

TO THE

REALLY NOBLE,

AND

DESERVEDLY HONORED

JOHN DUTTON

OF SHIRBURNE,

IN THE COUNTY OF

GLOUCESTER Esq.

NOAH BRIDGES,

To expreſs his ſingular obſervance,

DEDICATETH

theſe his LABORS.

Imprimatur

24. Augusti 1653.

JOHN BOOKER.

To the Reader.

I Did long ſince digeſt Vulgar Arithmetique into a School method, diſtinguiſh the Rules into papers apart, and affix variety of Examples carefully wrought to each Rule, as conceiving it a courſe much conducing to the improvement of Youth, and ſo conſequently to the faithfull diſcharge of my duty. Though that way ſeemed in ſome meaſure, to reach the end I aimed at, yet (Arithmetique, like green wood, will quickly extinguiſh without a conſtant blowing) ſome by

neglect, after they had quitted my care, loſt great part of what they had gained, for prevention whereof I contracted my method to fewer examples, and (qualifying thoſe under my charge with fair hands fit for entries) cauſed them to underſtand and work over the ſeverall examples in each Rule in the ſame order I had done, and then from my papers to make their Entries; conceiving, as in reaſon I might, that courſe would put them into a capacity to retain what they learned, or when they came to a loſs, to beat about and retrive it. But Boyes will be Boyes: Such was the indiſpoſition of ſome to their own good (notwithſtanding my care and pains for their advantage) that by their careleſs

tranſ-

transcriptions they cõmitted many errors both in the Rules & Examples, and by that means became sometimes unserviceable to themselves likewise. Many times since, I have (as some other Masters doe) entred the Rules and Examples into the Books of Learners, with great regard to the operation of the Questions; and yet I have met with Scholars from some of those Masters (probably they with others from me) who after a short time of discontinuance, were only accompanied with full Books and empty heads. The only expedient I could imagine for remedy of these inconveniences, was to print a method for Trade, which upon the advice and importunity of som of my acquaintance, able in the Art, I have adventured.

ventured to doe, presuming that the Learner, when therewith acquainted, cannot relapse beyond a possibility of retrivall, and that, by the omission of entries, much time and pains will be spared both to Master and Scholar. The work it self I freely submit to the judgement of those who understand the Art and the uses thereof, not doubting but it will finde a friendly acceptance, and encourage me to be, as I resolve,

Thy further serviceable friend

Noah Bridges.

From my house at *Rutner*, in the County of *Surry*
Aprill 25. 1653.

Where is taught the Greek and Latin Tongues; Also Arts and Sciences Mathematicall, *viz. Arithmetique, fair Writing, Merchants Accounts, Geometry, Trigonometrie, Algebra, &c.*

An admonition to the Reader, touching the Authors insertion of the Rules of Practise before the Golden Rule, and the Rule of Equation at the end of this Treatise.

MAny Learners, to my knowledge, apprehending, the Golden Rule to be troublesom and tedious, when

when they came to encounter it, cast by their Books and despaired of attayning the fruits of their labor; whereas others who began first with the Rules of Practise (as some Masters teach them) made them desired progresse to their great satisfaction. Nor can any Learner but acknowledge that the conveniencies, and vast variety of profitable pleasant and easie operations, which accompany those Rules, doe not only invite the fancy and strengthen the resolution to proceed, but also qualifie him for the more easie and better understanding of the Golden Rule.

The

The Rule of Equation is detected erroneous by that exquisite Artist Master *Kersey* in his supplement to Master *Wingates* Arithmetique *fol.* 179, and for that reason I had omitted it, but for those following, have (with caution) since inserted it.

Consulting some Merchants and others concerning that Rule, I found much of truth in Master *Wingates* assertion, in his preface to the use of the Rules of Proportion, *viz.* That it is no easie matter to drive men out of their old track. Thus Master *Norwood* in his Trigonometrie thought good not to neglect the

the Problemes of ſayling by the plain Sea-Chart, though the ground of its projection were falſe, and ſo the concluſions thence derived for the moſt part erroneous, becauſe it was eaſie, much uſed, and the errors in ſmall diſtances not ſo evident.

I confeſs likewiſe, That in payments of two or three hundred pounds, or ſuch like ſums, at two, three, four, ſix, eight, ten, or twelve moneths, the loſs accruing by the uſe of this Rule, is not (at any uſuall rate of Intereſt) highly conſiderable; but in payments of great ſums, the loſs is ſo valuable (as will appear by Examples in

n the Rule it ſelf) that I conceive the Creditors ſafety would countervail a quarter of an hours care and pains, and induce him to reject this, and to proceed according to thoſe of Rebate, which are rationally and artificially grounded, and infallibly true.

The

The Reader is desired
before he proceed, to ca
an eye upon the *Errata*
and, more especially, i
page 159. line 23. for 328 li
to read 100 li.

On the Incomparable Mr. *Bridges* his (by his favour) no *Vulgar Arithmetique.*

(1)

Ne're pretended to the Stagirite;
I alwaies was Subliminarie Wit:
The height of my Ambition was to know
(*But ah, in vain*) *what* Spirits *were below.*

(2)

Yet reach me Plumes, oh Fame, *and thou bright* Sun,
That in an undisturbed Course do'st run,
Shrilly to voyce alowd, justly to be
Kinde, Calm and Ev'n in this my Eulogie!

(3)

Oh Sacred Numbers, *to whose chiefest* Art
Poets & Prophets *doe their wreaths impart.*
Why are Wise *few, Fools* num'rous *in th' excesse?*
Cause, wanting Number, *they are* Numberlesse.

(4)

Numbers Divine! *Parent to* Harmonie,
And eldest Issue to Divinitie;
Twin to Great Love (*whose Laws so ev'nly hurl'd*)
Art sole Dictator *to this Busie World!*

(5)

Behold your Sacred Bard *that doth unharm*
All your learn'd Knots, and your ſtrong Rules diſarm
Your Prieſt *that with Delight doth* Sacrifice
Paſt Errors, Doubts, Miſtakes, unto the Wiſe.

(6)

And with this Smooth, Bright, Poliſht, Eaſie Key,
He opes a Dore unto a Roſie Way,
So far from vexing the Diſtracted Brain,
That Sculls *of* Lead *his* Golden-Rules *contain.*

(7)

Here He the Chaſt Arithmetick *undreſſes*
(Left vak'd as Truth) H' unbrades her very Treſſes
With ſuch Religious skillfull Luſt, that Wee
The very Secrets *of her* Secrets *ſee.*

(8)

This is a Modeſt Impudence, and Wiſe
Proſtration, ſo fairly t'undiſguiſe
The brighteſt Body, Fulleſt and Mature,
That e're Rich Robes or Jewels did Obſcure.

(9)

And now injoy her Gentlemen; and You
(Without offence) Ladies lye with Her too:
See! She unfolds her Sheets, and bids you ſpare
No Pleaſures, Joyes that there Revealed are.

(10)

Fly then on th' Breath *of* Glorious Renown,
And for thy Prieſt *ſnatch an eternall Crown.*
Oh Heav'nly Numbers! *That (as is moſt due)*
His Fame *may be as* Infinite *as* You.

Richard Lovelace.

To my valued Friend, the Ingenious and Industrious Author.

I L'e use no *far-fetcht Motives* to perswade
Love to this *Art*, so us'd in every Trade;
Since *sordid Gain* will of it self invite,
Although the *Minde* should harbour no delight:
Yet dare aver this *boundlesse Art* was ne're
So well apply'd to *Generall* use, as here;
Where *Rules* and *Precepts* are so cleerly shown
Ev'n *Dullest Heads* (at first) make all their own.
Merchant and *Chandler* (All that *Buy* or *Sell*,)
May finde our *Author* hath done rarely well.
Now since thy *Genius* (Friend!) with such success,
Brings others this Advantage, be not less
Kinde to thy self: learn th' use of those Divine
And naturall power of sacred *Numbers*; Joyn
Formall with *Vocall*: In which mixture lyes
Th'unfathom'd depth of greatest *Mysteries*.
For *Number* is the *Mother*, and the *Key*
Of Arts; gives *Lyfe*, & opens to a *Sea*
Of Knowledge, whence a Diving hand
May bring whats'ever it conceals to Land.

Number is that whereby *Created Things*
Subſiſt, and from whoſe *Root* their vertue ſprings:
The Pattern in our great *Creators* Minde,
Whence all things did both *Form* and *Matter* finde.
Nay, 'tis preſum'd, the *Soul*'s a Harmony
Fram'd out of *Numbers* bleſt *Concordancy*!
The ſtrict *Obſerver*, by their *Power* may skrew
Into the *Creatures Properties*, and view
Their diſtinct *Vertues*, *Natures*, *Forms*, and tell
The uninſtructed World, where *Secrets* dwell:
And, by *Material things*, ſtill upward riſe
To th' height of *Immaterialities*.

Elias Aſhmole.

To

To my Honored Friend *Noah Bridges* Esq; Master of the Mathematicall Science of Arithmetique.

THe Chymick Goddesse, great Minerva *gave*
Seven Minerals, to raise man from the Grave
Of Ignorance, to Resurrection
In knowledge, the true Philosophique stone.
Ramus, *and* Lilly *cannot challenge more*
Deserved Praise then Bridges, *on the score*
Of Benefit; For his Arithmetick
Gives life to dead Commerce, makes dull Trade quick;
And these, wee know, make Kingdomes opulent,
And happy, under a Right Government.
In order whereunto, let Bridges *bee*
Priest to Minerva, *Chairman of the three.*

Tho. Shirley.

Upon his induſtrious Friend Mr. Noah Bridges *his exact and compos'd method of Arithmetique.*

IN full accompt come forth: Now the bank's high,
And we doe want a Rule to reckon by.
The Prize-Office ſtands ſhut, and only waits
Thy Forme, by which they may not cheat the States.
Accompts go on, nay the ſad Duch *beſpreaken*
Myn-Here Noah Bridges very right doe reckon.
But to adorn thy Labours, ſo long out
Eſcap'd the Fury and the Navall Rout.
The *Smyrna* Merchant will her wealthy Bills
Submit to this thy work, and its known skills.
It was a Providence, no contriv'd trick,
That Ships arrivall, and thy Arithmetick.
How with a courage the young Merchants prate
Of Number Numerants, and Numerate?
Arithmetique is ſweet, when that wee look,
And finde caſh o'th' Boord concordat o'th' Book.
How our joy'd hearts would proudly dance and leap
Each day for ſuch a Book and ſuch a Ship.
But (Friend) I fear you muſt addition make,
If *Holland* every day we Captive take
And bring into the *Downs*; It wo'nt ſuffice;
Not one Arithmetique to ſum the Prize.
To work again, our profits come ſo faſt,
Wee ſhall want figures our ſwift wealth to caſt.

E. Gayton.

To my worthy Friend the Author.

HOw thinn and empty all thoſe ſtudies are
That fill our pretious time, when I compare
The nobler uſes of thy Art? Wee dreſſe
The Idols of our Brain, and make the Preſſe
Groan with th' impertinent burdens of our Pen,
When 'tis Arithmetique concerneth men;
By whoſe ſtrong hand, next Heavens, are dayly wrought
Things next to miracle, and Children taught,
By myſtique numbers, to undoe the Chain
Of Nature, and unite the Links again;
To give account of either Globe, and what
Is fit for our tranſaction in each ſtate.
Oh! ſtop profaner Artiſts, think, how yee
Miſtook in the purſuit of Harmonie,
Have all this while condemn'd your ſelves, to ſeek
The Child of Heav'n without Arithmetique.
I, willing now, could loſe my ſelf, or grow
From my firſt ſeeds again, and all unknow,
Except this Science, if by ſuch a hand
As thine, I might be led to underſtand.
But wiſhes beat the aire: It muſt ſuffice
That all congratulate this Maſter-piece
Of thy Arithmetique, and made compleat
Now, when our States accounts are grown ſo great.

J. S.

To his ingenious Friend Mr. Noah Bridges *upon his* VULGAR ARITHMETICK.

Friend,

I Stood amaz'd, when firſt I ſaw,
Ev'n in thy Title, ſuch a flaw
As made me (though engag'd) withdraw.

Why ſhould Arithmetique now be
Accounted Vulgar? when we ſee
It thus Ennobled by thee.

Alas! that Title 's now too poore,
Since that thy Cyphers ſtand for more
Then all their Dec'mals did before.

Pythagoras doubtleſſe, whoſe deep skill
Did th' Univerſe with numbers fill,
Nay, made it of them, now ſits ſtill.

He ſhall no more, too perfect grow,
Seek new abodes, above, below,
By Tranſmigration: He 's here ſo.

The Writhel'd Uſurer heretofore
Oft made his parched fingers ſore,
With reck'ning up his crowded Ore.

One line of Thine ſhall teach him more
Then all the watchfull nights before,
When *Lucians* Cock unlock't his dore.

Meletides, who ne're could thrive
In computation, beyond five,
May now in's Noddle millions hive.

The Debtor, who was ne're eſpide
Even with his Creditor, undenide
Fills up, in thee, as juſt a ſide.

Nay, what's ſo dreadfull, to be poore
Should ne're be known, could but our ſtore
(A thing of nothing) match thy ſcore.

Wee 'l therefore lay our Pearls aſide,
And with thy twiſted numbers, tide
In Golden wreaths, bedeck our pride.

Nay more, deer friend, free from controle,
I'le chant thy Praiſe from Pole to Pole,
Doe but once make our Fractions whole.

T. D.

Some Innocent Thoughts reflecting on this Divine Art, and the (therein) Learned Author [My Noble Friend *Noah Bridges* Esq;]

FRiend! I could ſing thy Vertues (Fairly too,
Without conſulting any Topique, how)
But what were that? Th' are written on thy Brow.

I could ſay how this work doth us engage,
How Judgement ſwells the veins of every Page:
But to what end, whilſt Dulman *ſwayes the Stage?*

I could prove Numbers did Anticipate (Date:
Heav'ns, Earth, and Seas, and Man's Life-breathed-
But What were this unto an Infant-State?

I could declare how ſimple numbers be,
How (like the Soul) from matter pure and free:
But what were that to Groſſer Anarchie?

I could ſay numbring things was their Creation,
Continuall numbring them, their Conſervation:
But what would that avail a Reformation?

Thoſe are but trifles, tedious to repeat,
Hard to digeſt, and void of Lyrick-Heat:
Nor would they add unto the Publique-Cheat.

I'le

only this (in my Hoof-beaten-ſenſe:)
Art will number our beloved Pence,
'n twice-told ſixty thouſand Pounds per Menſ.

will give the Aggregate of Engliſh Woe,
duct our Friends, and leave the barb'rous Foe
publique Juſtice: Who that is, All know.

will teach both Sexes how to Multiply,
ll Earth with Saints, they it with Prodigie;
las! the Factus with Hypocriſie.

Will tell us how we may Divide the Land,
Now held ſo faſt by Our All-Conquering Hand)
ut ſtay! The Quotient 's but a Rope of Sand.

ow Fractions be Reduc'd, how truly wrought,
Still ſomething, yet (oft) little more then nought,
nd that, like ſome Men's Treaſon, but in Thought.)

will conduct us to the Rule of Three,
That Golden Rule, wherein All ſtrive to be]
uppoſe it were Great Rome's Triumviri:

hence flowes the Rule of Fellowſhip: [but dead
air Julia, and Craſſus vanquiſhed;
Cæſar (in ſpight of Pompey would be Head.]

Then

Then Alligation, *or a* Quaint Deviſe
Of mixing different Rates and Qualities:
[*Beggers with Kings, Rich Robes with Rags & Liee*

Compendious Rules of Practiſe, that doe lend
Ready Reſolves (for ſuch as Buy or Vend)
In all things elſe, but When th' exciſe will end.

Right ſubtil Queſtions, both of Uſe and Pleaſure,
Exchanging Coyns, Æquating Weight and Meaſur
Impoſing Rates on our tranſported Treaſure.

Short Rules of Intereſt (I doe not mean
The Publique Beaſt's (ſo ugly and unclean!)
The Honeſt Uſerer ſhall own the Quean.

All this emerges from this Art and more,
More Worth then all the Erythræan *ſhore;*
[*Pearls are but droſs to ſuch tranſcendent Store.*]

Which Art (ſo fully underſtood by thee)
Serves both for Scripture and Philoſophy.
Would (Noah) *'twere any thing could ſet us Free!*

But here I lagg! Cleveland, *our Prince, his Lays*
[*His ſinewy ſtrain*] *can only reach thy Praiſe:*
It is enough, if I apply the Bayes.

G. VVharton *Eſq*

To the Reader.

IF th' hast determin'd not to fix thy choise,
But where the glorious Title makes a noise
With Decimals and Logarithmes, and
What th' art resolv'd never to understand,
Trouble not thy self with this; 'twas writ for those
Who purpose to make use of what they choose,
For him that buyes to read, and will be known,
Not by his learned Closet's skil, but 's own.
But if, with better judgement, thou discern
Between what's taught, & what thou art to learn;
If thou disdain not to become a Guest
Where no superfluous dishes grace the Feast,
That are not to be carv'd, thou wilt in this,
Not find th' whol Art perhaps, but nothing miss.
'T presents thee with Arithmetique confin'd
To what it was at its first birth design'd:
Which since we owe to the *Phenicians* skill
Why should not Merchants lay their claim to 't still?
Who may fetch home the *Indies*, and not know
What *Napier* could, or what *Oughtred* can doe.
Shall we not venture in a Bark to Sea,
Except the spacious Forrest from each Tree
Contribute to its building? or can none
Make a fair statue, unless all the stone

I' th'

I' th' Quarry be made uſe of? Something yet
Others may have more, this hath all that 's fit.
So when the ſwelling ſtream, which had run o're
Its narrow banks, is reduc'd home onee more
Within thoſe firſt bounds, though't be narrow
More navigable is, and more its own. (grow
Nor is 't made leſſe only; that thou might'ſt d
Read but a little, the big'ſt is ſo too.
Arithmetique is not ſo finite, but
You may, as t' any number, ſtill add to 't;
And when a *Cadmus* hath done well before,
A *Palamedes* may yet finde out more.
Some new Coaſts are diſcovered to your view,
And neerer waies to thoſe you before knew:
The Art ſo much improv'd, that we ſcarce know
Whether, till now, it were an Art or no.
'Tis yet no envious hand that gives thee this,
Clouding it ov'r with reſerv'd myſteries.
Th' amuſement is not ſought in 't, but thy good;
'Twas written only to be underſtood.
Read then, and thou wilt quickly finde it ſuch,
The quarrel only 'l be, it ſhews too much.

G. Myller.

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Chap. I.

Of Number.

Notation, by ſome called Numeration, *teacheth how to form the numerall figures, as they muſt be written; and to pronounce them with their values and ſignifications, as they muſt be read.*

II. *The characters or notes, by which number is ordinarily expreſſed, are theſe,*

one	two	three	four	five	ſix	ſeven	eight	nine	cypher or nothing.
1	2	3	4	5	6	7	8	9	0

III. *Theſe notes are either ſignificant figures, or a cypher. The ſignificant figures are* 1 2 3 4 5 6 7 8 9, *the cypher* 0.

IIII. *Every figure in the firſt place*

is it's own value once, *in the second* ten tymes, *& in the third a* hundred tyme *as much; for every place exceeds the o ther ten, as appears by the following table*

The names of the places.	Unites	Tens	Hundreds	Thousands	x. Thousands	C. Thouf.	Millions	x. Millions	C. Millions
One	1	1	1	1	1	1	1	1	1
Two	2	2	2	2	2	2	2	2	2
Three	3	3	3	3	3	3	3	3	3
Four	4	4	4	4	4	4	4	4	4
Five	5	5	5	5	5	5	5	5	5
Six	6	6	6	6	6	6	6	6	6
Seven	7	7	7	7	7	7	7	7	7
Eight	8	8	8	8	8	8	8	8	8
Nine	9	9	9	9	9	9	9	9	9
Nothing	0	0	0	0	0	0	0	0	0
The order of the places.	Firſt	Second	Third	Fourth	F.ft	Sixt	Seventh	Eighth	Ninth

V. *To expreſs the value of any number given, begin at the right hand and reckon*

eckon toward the left, according to the Table, which will be more evident by the following order.

k	i	h	g	f	e	d	c	b	a		i	h	g	f	e	d	c	b	a
										or									
9	8	7	6	5	4	3	2	1	0		9	8	7	6	5	4	3	2	1

VI. *To pronounce a number, begin at the left hand read towards the right:*

EXAMPLES.

1234567890	1 million of millions, 234 mill. 567 thouſ. 890
234567890	- 234 millions, 567 thouſand, 890
34567890	-- 34 millions, 567 thouſand, 890
4567890	--- 4 millions, 567 thouſand, 890
567890	——— 567 thouſand, 890
67890	——— 67 thouſand, 890
7890	——— 7 thouſand, 890
890	——— 890
90	——— 90
0	——— 0

VII. *Or firſt fix a point over the fourth, and afterwards over every third place towards the left hand; and for every point pronounce* thouſand, *as in the following example, which may be read thus,* one hundred twenty three thouſand

thouſand, four hundred fifty ſix thouſand, ſeven hundred eighty nyne, 123456789. *And, as this, ſo any other number may be diſtributed and pronounced.*

VIII. *The uſe of a cypher is (by filling a place in that number) to augment the value of other figures.*

IX. *One (or more cyphers) in the laſt place of any number towards the left hand* (as in theſe 0324 0032 0000320.) *is uſeleſs, becauſe no ſignificant figure is thereby advanced to a more valuable place.*

X. *A cypher, in any other place, adds to the value of the number*; viz. in 2200 the two ſignificant figures, are raiſed two places higher by reaſon of the two cyphers; for without thoſe they repreſent but twenty two; but by annexing the cyphers, they become two thouſand and two hundred.

XI. *Numbers are divided into* digits *and* articles, *and compounded of both*, as in the following examples.

Digits

Compound numbers	Article numbers	Digits
6597	90	9
4398	80	8
7654	70	7
1792	60	6
3408	50	5
7956	40	4
4379	30	3
6385	20	2
6008	10	1

XII. *Every number is either simple or mixt.*

XIII. *A simple number is that, whose parts are of one and the same kind, that is, either whole or broken.*

XIIII. *A whole number is that which consists of* integers, *that is, intire* unities; as 22, which is compoſed of two and twenty *integers*, or intire *unities*. A whole number.

XV. *A broken number, otherwiſe called a* fraction, *is part of an* integer, *or whole thing; and the notation, writing* A fraction

ting or repreſentation of ſuch fraction *is done in two ranks or terms, with a diſtinguiſhing line thus*, $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ the upper terme being *numerator*, the lower *denominator*: The firſt *fraction* expreſſeth one half; the ſecond, one third, and the third, one fourth, which we commonly call one quarter.

XVI. Alſo theſe *fractions* $\frac{2}{3}$ $\frac{3}{4}$ ſignifie each of them, not one ſingle part, but parts of ſome *unite* or whole thing; whereof, the firſt betokeneth two third parts, the ſecond three quarters or fourths, and the third four fifts, or four fift parts, and are ſo read and called.

XVII. *The numerator denotes how many parts of a* unite *a* fraction *conteyneth; and the denominator the name and kind of the parts whereinto the* unite *is divided, by both which the truth and certainty of the parts repreſented, may appeare*, viz.

XVIII. Let $\frac{1}{4}$ ſignifie ſome parts

f an intire ſhilling, and the deno-
inator declares the ſhilling to be
ivided into four parts or quarters,
nd not into any other kind of parts;
nd the numerator, how many of
hoſe parts or quarters the *fraction*
onteyneth; and ſo between them
oth a certain portion of the whole
hilling is truly expreſſed, which is
yne pence, every quarter or fourth
eing three-pence.

XIX. *A fraction, or broken number, is either proper or improper, and thus diſtinguiſhed.*

XX. *The numerator of a proper fraction is leſs then the denominator, and repreſents ſome part of an intire thing,* as in the 18. ſect. of this chap.

XXI. *An improper fraction hath a numerator greater then its denominator,* as $\frac{9}{4}$, which contayneth two *integers* and $\frac{1}{4}$ part of an *integer*.

XXII. *A mixt number hath two parts, the one whole, the other broken,* as $3\frac{4}{5}$, $12\frac{8}{12}$, &c.

XXIII. *The things expreſſed by bro-*
ken numbers are principally the parts o
fractions of money, weight, meaſure
tyme, and things accompted by the doZen
Of the three firſt of theſe, there are infi-
nite kindes and varieties, according t
the diverſity of the places in which the
are uſed, all which to produce were bot
endleſs and needleſs: I ſhall therefore on
ly mention ſuch as are uſed amongſt u
and neceſſary to be known for our purpoſe

The Fra-ctions.

XXIIII. *The leaſt part or fractio*
of money uſed in England *is a farthing*
from whence is produced this table fol
lowing.

1 Of Engliſh monie	1 *Farthing*	*make*	1 *Farthing.*
	4 *Farthings*		1 *Penny.*
	12 *Pence*		1 *Shilling.*
	20 *Shillings*		1 *Pound ſterling.*

In this table you may obſerve
pound *ſterling*, being eſteemed an *in-*
teger, is divided into 20 parts or *ſhil-*
lings, ſo that one *ſhilling* is a broke
numbe

number of a pound *ſterling*, and thus written $\frac{1}{20}$, that is, one twentieth of a pound *ſterling*: Alſo nine *ſhillings* are $\frac{9}{20}$l. Likewiſe a *ſhilling* divided into 12 parts or *pence*, one *penny* is $\frac{1}{12}$s. that is, one twelfth of a *ſhilling*, or $\frac{1}{12}$ of $\frac{1}{20}$l. that is, one twelfth of one twentieth of a pound *ſterling*: Laſtly, a *penny* being divided into 4 parts or *farthings*, one *farthing* is $\frac{1}{4}$d. that is, one fourth of a *penny*, or $\frac{1}{4}$ of $\frac{1}{12}$s. that is, one fourth of one twelfth of a *ſhilling*, or $\frac{1}{4}$ of $\frac{1}{12}$ of $\frac{1}{20}$l. that is, one fourth of one twelfth of one twentieth of a pound *ſterling*. Now albeit the true and naturall way of expreſſing broken numbers, is by their numerators and denominators, as before; yet the broken numbers or *known parts* of money, weight, meaſure, &c. are ordinarily (for more convenient operation) expreſſed like *integers*, as may appear by the 5. *rule* of the ſecond and third chapters: So if you were to

expreſſe

expreſs in figures thirteen ſhillings five pence half penny farthing, the ordinary way to ſet them down is briefly thus, 13 s. 05 d. 3 q. or thus, 00 l. 13 s. 05 d. 3 q. but the ſaid thirteen ſhillings five pence three farthings being diſtinctly conſidered as fractions of a pound *ſterling* will be properly written thus, *viz.*

13 Shillings are thirteen twentieths of a pound *ſterling*, and writen thus, —— $\frac{13}{20}$

5 pence are $\frac{5}{12}$ of $\frac{1}{20}$ of a pound *ſterling*, that is, (as will appear by the 11 and 3 rules of the 7 chapter) one fourty eighth of a pound *ſterling*, and written thus. —— $\frac{1}{48}$

3 Farthings are $\frac{3}{4}$ of $\frac{1}{12}$ of $\frac{1}{20}$ of a pound *ſterling*, that is (as will appear by the 11 rule & the firſt example of the fourth rule of the ſeventh chap.) one three hundred and twentieth of a pound *ſterling*, and writen thus, —— $\frac{1}{320}$

XXV. *The leaſt fraction of weight uſed in* England *is a grain, that is, the weight of a grain of wheat well dryed and gathered out of the middle of the eare, whereof* 32 *make a penny weight, and* 20 *penny weight make an ounce* Troy.

Vide Stat. de compoſitione ponderum. 51 H. 3.

But here obſerve, albeit by the Statutes quoted in the margent, the weight of 32 ſuch grains of wheat make but a *penny weight*; yet the weight thereof being once diſcovered by 32 ſuch grains, the ſaid penny weight (being the twentieth part of an ounce *Troy*) is uſually ſubdivided into 24 parts only, called *grains*, as pears by the enſuing *Table*.

31 E. 1. *V. Raſt.* weights. & 8, 12 H. 7, 5.

1 *Grain*

1 *Grain*		1 *Grain,*	*gr.*
24 *Grains*		1 *Pen. weight,*	*dw.*
20 *Penny w.*		1 *Ounce Troy,*	℥.
12 *Ounc. Troy*		1 *Pound Troy,*	lb.
14 *Ounces,* 12 *penny Troy*		1 *Pound Aver dupois.*	lb.
14 *Pounds Averdupois*	*weight makes*	1 *half quarter of a hund.*	½ *qu.*
28 *Pounds Averdupois*		1 *quarter of a hundred,*	*qu.*
56 *Pounds*		1 *half of a hundred,*	½ *C.*
112 *Pounds*		1 *Hundred,*	*C.*
5 *Hundred*		1 *Hogshead weight,*	*hh.*
10 *Hundred*		1 *half of a Tun,*	½ *Tun.*
20 *Hundred*		1 *Tun,*	1 *Tun.*

thus caracktered

XXVI. *You may observe by the table aforegoing, that there are* 2 *kindes of weight used in* England, viz. Troy *and* Averdupoiz *weight.*

XXVII. *The pound* Troy *consisteth of* 12 *ounces* Troy, *each ounce being again divided into twenty penny weights, and each penny weight into four and twenty*

twenty grains: Wherefore here a pound *Troy* being counted the *integer*, the ounces, penny weights and grains are taken as *fractions* thereof; ſo 1 ounce *Troy* is written thus $\frac{1}{12}$lb. that is one twelfth of a pound *Troy*. Alſo one penny weight is $\frac{1}{240}$. that is, one twentieth of an ounce *Troy*, or $\frac{1}{20}$ of $\frac{1}{12}$lb. that is, one twentieth of one twelfth of a pound *Troy*. Laſtly, 1 grain is $\frac{1}{24}$dw. that is, one four and twentieth of a penny weight *Troy*, or $\frac{1}{24}$ of $\frac{1}{20}$ of $\frac{1}{12}$lb. that is, one four and twentieth of one twentieth of one twelfth of a pound *Troy*. So 9 ounces, 8 penny weight and 16 grains being propounded to be written properly as fractions of a pound *Troy*, are expreſſed thus:

9 Ounces are $\frac{9}{12}$ of a pound *Troy*, that is, (as will appear by the ſecond example of the fourth rule of the ſeventh chapter) ——— } —— $\frac{3}{4}$lb.

8 penny

8 Penny weight are $\frac{8}{240}$ of $\frac{1}{12}$ of a pound *Troy*, that is (as will appear by the 11 and 3 rules of the 7 chap.) } $\frac{1}{30}$ lb.

16 Grains are $\frac{16}{24}$ of $\frac{1}{20}$ of $\frac{1}{12}$ of a pound *Troy*, that is, (as will appear by the 11 and 2 rules of the 7 chap.) } $\frac{1}{360}$

Or briefly thus (after the manner of *integers* or whole numbers) 9 ℥. 8 dw. 16 gr. or thus, 0 lb. 9 ℥. 8 dw. 16 gr. that is, no pounds, 9 ounces, 8 penny weight and 16 grains.

Malynes lex mercat. pag. 49. XXVIII. Now this *Troy weight* not onely serveth to weigh bread, gold, silver and Electuaries; but also regulateth and prescribeth a form how to keep the money of *England* at a certain *Standard*.

Malynes ibid. pag. 252.

Malynes ibid. p. 49. XXIX. By *Averdupois* weight is weighed all kinde of Grosery ware, as also Butter, Cheese, Flesh, Tallow, Wax, and every other thing which beareth the name of *Garbell*, and whereof issueth a refuse or waste.

XXX.

XXX. Averdupois *weight is either greater or leſs, that is, groſs or ſubtile.*

XXXI. *The greater is when an hundred, conſiſting of* 112 *pound* Averdupois, *is the* integer, *being ſubdivided firſt into* 4 *quarters, and each quarter into eight and twenty pounds, again each pound into four quarters, or if you will be more exact, into ſixteen ounces, and if you pleaſe, each ounce into four quarters:* And here the quarters, pounds, ounces, and quarters of ounces are the parts or fractions of an hundred: ſo half an hundred, ſeventeen pounds, ſeven ounces and a quarter, being propounded to be written properly as fractions of an hundred, will be thus expreſſed:

Half an hundred is $\frac{1}{2}$ C.

17 pounds are $\frac{17}{28}$ of $\frac{1}{4}$ of an hundred (as will appear by the 11 rule of the 7 chapter) $\frac{17}{112}$ C.

7 Ounces

7 Ounces are $\frac{7}{16}$ of $\frac{1}{28}$ of $\frac{1}{4}$ of an hundred, that is (as will appear by the 11 rule and 2d example of the fourth rule of the 7 chap.) —— $\frac{1}{256}$ C.

1 Quarter of an ounce is $\frac{1}{4}$ of $\frac{1}{16}$ of $\frac{1}{28}$ of $\frac{1}{4}$ of an hundred, that is, as by the 11 rule of the 7 chapter will be manifeſt, —— $\frac{1}{7168}$ C.

XXXII. *The leſs is when a pound is the* integer, *each pound being ſubdivided into* 16 *ounces, and each ounce again into* 16 *drams, and* (*at pleaſure*) *each dram into four quarters.*

Or when a pound is the integer, *each pound being ſubdivided into* 16 *ounces, and each ounce into* 8 *drams, and each dram into* 3 *ſcruples, and each ſcruple into* 20 *grains:* And in the one of theſe, the ounces, drachmes and quarters; and in the other the ounces, drachmes, ſcruples and grains are the parts or fractions of a pound *Averdupois, &c.*

Grains,

Grains	*thus charactered*	*gr.*
Scruples		℈
Drachmes		ʒ
Ounces		℥
Pounds		℔

XXXIII. *The measures used in* England *are either of capacity or length.*

XXXIIII. *The measures of capacity are those which are produced from weight, and they are either liquid or dry.*

XXXV. *The liquid measures are those in which all kinde of liquid substances are measured, and are expressed in the Table following.* Of liquid measures.

Pound of Wheat Troy W.	*makes*	1 *Pinte* ——— *pt.* V. 12 H. 7 cap. 5.
Pints		1 *Quart* ——— *qt.*
Quarts		1 *Pottle.*
Pottles		1 *Gallon* ——— *gall.*
Gallons		1 *Firkin of Ale, Sope, Herring.*
Gallons		1 *Firkin of Beere.*
0½ *Gallons*		1 *Firkin of Salmon or Eeles.*
Firkins		1 *Kilderkin.*
Kilderkins		1 *Barrell.*
2 *Gallons*		1 *Tierce.*
3 *Gallons*		1 *Hogshead* ——— *hh.*
Hogsheads		1 *Pipe or Butt.*
Pipes, or Butts		1 *Tunn.*

Of dry measures.

XXXVI. *Dry measures are those, in which all kinde of dry substances are meted*, as grain, sea-cole, salt, and the like; *their table is this that followes.*

1 *Pint*	*makes*	1 *Pint.*
2 *Pints*		1 *Quart.*
2 *Quarts*		1 *Pottle.*
2 *Pottles*		1 *Gallon.*
2 *Gallons*		1 *Peck.*
4 *Pecks*		1 *Bushell land measure.*
5 *Pecks*		1 *Bushell water measure*
8 *Bushells*		1 *Quarter.*
4 *Quarters*		1 *Chalder.*
5 *Quarters*		1 *Wey.*

Of long measures. *V.* 33 *E.* 1. & 25 *Eliz.*

XXXVII. *Long measures are expressed in the following Table.*

3 *Barly Cornes*	*makes*	1 *Inch.*
12 *Inches*		1 *Foot.*
3 *Foot*		1 *Yard.*
3 *Foot* 9 *inches*		1 *Ell.*
6 *Foot*		1 *Fadome.*
5 ½ *Yards*		1 *Pole or Pearch*
40 *Poles or pearches*		1 *Furlong.*
8 *Furlongs*		1 *English mile.*

XXXVIII

XXXVIII. *A Table of tyme is this* Of Time.
hat followes.

Minute		1 *Minute.*
0 *Minutes*		1 *Houre.*
4 *Houres*	*makes*	1 *Day naturall.*
Dayes		1 *Weeke.*
Weekes		1 *Moneth of* 28 *dayes.*
3 *Moneths,* *day, and* *Houres.*		1 *Yeare.*

Howbeit, in ordinary computati-
ns of *time*, the whole year consist-
g of 365 dayes, is divided into 12
oneths, each moneth (accounting
ne moneth with another) contain-
g 30 $\frac{5}{12}$ dayes.

XXXIX. *Of things accounted by the*
ozen, a grosse is the integer, *consisting*
12 *dozen, each dozen again containing*
particulars, which are said to be parts
fractions of a grosse.

Chap. II.

Of Addition.

1. Of Addition of integers.

I. *Addition is the gathering together and bringing of two numbers or more into one ſumme.*

II. *In addition place the numbers given one above another, in ſuch ſort, that the like degrees may ſtand in the ſame ranke,* that is, unites above unites, tens above tens &c. So the numbers 1234 and 465 being given to be added together, you are to order them as you ſee in the margent.

1234
465

III. *Having thus placed the numbers and drawn a lyne under them, add them together, beginning with the unites firſt,* and ſaying thus, 3 and 4 make 7, which write under the line in the rank of unites; then 5 and 3 make 8, which

write in the next place toward the left hand, in the rank of tens; and so proceed til you have finish ed the whole Addition, which done, the summe of these two numbers is 5887, and the intire operation will stand thus.

Unites	tens	hund.	thous.
1	2	3	4
4	6	5	3
5	8	8	7

In like manner the numbers 5123, 3275 and 101 being given, their summe is 8499, and the operation thereof will stand thus;

5123
3275
101
8499

IIII. *When the summe of the figures of any of the ranks amounts to* 10, *place down under the same rank a cypher, but when it exceeds* 10 *place down under the same rank the excesse, and for each ten carry one in your minde, and add it to the figures of the next rank towards the left hand.*

So the numbers 4607, 8628, 6845, 130, and the numbers 789 and 811 being given to be added together, the operations will stand as foleth.

The figures in the first rank making 20, I set down 0 exactly under the same rank (there being no excesse)

	4607	78
	8628	81
	6845	160
	3130	
	23210	

and carry 2 to the next place; those in the second rank, with the 2 I carry making 11, I set down 1, and carry 1 to the third place; the third rank, with the 1 I carry'd making 22 I set down 2 the excesse, and carry 2 to the fourth place; the 2 I carry and the figures in the fourth ranke making 23, I set down 3, and because the 2 I bear in minde cannot be carryed to another ranke (the operation being finished) I set 2 that I bear in minde a place toward the left hand beyond the 3: and the like order is to be observed in the following and all other examples.

37097

37097	90099
97079	70987
97097	30656
99998	30578
331271	222320

V. *Addition of* integers *may bee proved thus, viz.* draw a lyne, as in the margent; that done, caſt away all the nines in the ſeverall ſummes given to be added, and ſet the remainder at one end of the lyne; then caſt away the nines from the totall, and ſet the remainder at the other end, and if both remainders agree the operation is right, as in the margent.

Proof of Addition by Subtraction. *vide* chap. 3. rule 6.

98789	
35789	
134578	
1	1

VI. *When the numbers propounded to be added, have divers denominations, you muſt begin with the leaſt firſt; and where the ſumme of any denomination mounts to an* integer, *add it to the next* integer *upon the left hand (the exceſſe in every rank being firſt ſet down under its*

Addition of monie.

own rank) that is, for every 4 farthings carry a penny to the place of pence, and for every 12 pence a ſhilling to the place of ſhillings, and for every 20 ſhillings, a pound to the place of pounds; and in the place of pounds obſerve the method of adding *integers*, and for every ten carry one to the next place: So the firſt ſix ſummes, and likewiſe the ſecond ſix being propounded to be added, their totalls will be found as in the margent.

li.	s.	d.
80254.	10.	07
23547.	11.	00
7853.	12.	10
248.	00.	01
93.	10.	01
7.	11.	11
	2	2
113004.	16.	06

li.	s.	d.	f.
324.	17.	03.	1
1020.	18.	07.	0
9030.	10.	03.	3
780.	13.	09.	2
100.	11.	03.	3
2000.	09.	01.	2
4	2	2	
13258.	10.	04.	3

The rank of pence in the firſt operation make 2 s. 6. d. the ſix pence (being the exceſſe) I ſet down under the ſame rank, and carry 2. s. to the

place

place of ſhillings, which, added to that rank, make 2.l. 16.s. the 16.s. being the exceſſe, I ſet down under the rank of ſhillings, and carry 2.l. to the place of pounds, and then proceed as in integers, and for every ten bear one to the next place: from whence you may obſerve, *That in the collecting or gathering together of the ranks of li s. d. f. the exceſſe (remayning) in the rank of farthings, if the operation be rightly performed cannot exceed 3, the exceſſe in the place of pence 11.d. nor the exceſſe remaining in the place of ſhillings 19.s.* which may yet more plainly appear by the laſt operation in the margent. 1 Obſervation.

li.	s.	d.	f.
908–	19–	11–	3
808–	10–	10–	3
809–	09–	01–	1
	1	1	1
2526–	19–	11–	3

And for help of memory, you may obſerve, *That ſo many pence as are carryed from the rank of farthings, are fixt at the foot or end of the rank of pence in a ſmaller character, and ſo the ſhillings* 2 Obſervation.

lings caryed from the ranke of pence at the end of the rank of shillings, and the pounds carryed from the place of shillings neer the end of the first rank of pounds, as will yet be more obvious by the following example.

lb.	s.	d.	f.
908	19	11	3
709	18	10	3
908	19	10	3
898	18	09	3
908	17	10	2
799	13	08	1
899	17	11	3
6	6	4	
6035	07	01	2

Addition of measure 1 Cloth measure by the yard: *v.* sect. 6 in this chap.

VII. *In adding of the measures of cloth sold by the yard, qu. and nail, 4 nails making a quarter, and 4 quarters a yard; for every 4 nayls carry a quarter to the second place, and for every four quarters a yard*

y.	qu.	n.
304	3	2
507	2	3
608	2	3
508	3	2
3	2	
1930	0	2

to the third; and then proceed with addition of the integers, as in the margent before.

2. *In adding the measures of cloth sold by the ell, yard and nail, for every 4 nails carry a quarter to the place of quarters, and for every 5 quarters an ell to the place of ells, as by this second example in the margent.*

E.	qu.	n.
29	2	3
39	2	3
50	3	2
69	4	3
67	3	2
3	3	
248	2	1

2 Cloth measure by the ells *v.* sect. 6. in this chap.

VIII. *The same order is (according to the 6 sect. of this chapt.) to be observed in the severall additions of weight, measure, tyme, motion, &c, whereof (in all the particulars pertinent to our purpose) I have (for the advantage of tender capacities) set down these examples.*

lb.	℥	dw.	gr.
457.	11.	19.	23
86.	10.	17.	20
9.	11.	14.	18
2	2	2	
554.	10.	12.	13

lb.	℥	ʒ	℈	gr.
20.	15.	7.	2.	19
30.	14.	6.	1.	18
9.	13.	7.	1.	09
2	2	2	2	
61.	12.	6.	0.	06

Troy, and Averdupois subtile

For

In the first example before going for 24 gr. *carry a* dw. *for* 20 dw. *carry an* ℥, *for* 12 ℥ *carry a* ℔.

In the second for 20 gr. *carry a* ℈, *for* 3 ℈ *carry a* ʒ, *for* 8 ʒ *carry an* ℥, *for* 16 ℥ *carry a* ℔.

Averdup. gross.

	C.	qrs.	℔.	℥
	929	3	21	07
	785	3	18	09
	329	3	27	09
	357	2	25	15
	2	2	2	
	2403	2	09	08

For 16 ℥ *carry a* lb. *for* 28 lb. *carry a* qu. *for* 4 qu. *carry a* C.

Liquid measure: *v.* 6. & 8. sect. afore going.

Tuns	hh	gal.	pts	qrs	pts.		Tuns	hh.	gal.	pts.
120	2	60	1	1	1		20	3	60	0
30	3	05	0	0	1	or	30	2	59	7
20	3	10	1	0	1	or	20	3	62	7
30	0	55	0	0	0		30	0	50	6
2	2	1	1	1			1	2	2	
202	2	05	1	0	1		103	3	44	4

For 2 pts. *carry* 1 qt. *for* 2 qts. *carry* 1 pot. *for* 2 pot. *carry* 1 gall. *for* 63 gall.

gall. *carry* 1 hh. *for* 4 hh. *carry* 1 Tun, *or, for* 2 hh. 1 Butt, *and for* 2 Butts 1 Tun.

Measures dry.

Bush.	pecks	pintes
127	3	11
256	1	07
345	0	00
184	2	10
1	1	
913	3	12

Measures of time.

years	dayes	hours	min.
12	100	20	40
19	220	23	59
13	065	28	59
1	2	2	
45	023	01	38

For 16 pintes *carry a* peck, *and for* 4 pecks *carry a* Bushell.

For 60 minutes *carry an* houre, *for* 24 houres *carry a day, for* 365 dayes *carry a* year.

Long measure.

feet	inches	quart.
124	07	3
246	11	4
134	07	2
120	08	0
72	10	2
3	2	
699	09	3

In

In the last example, for 4 qu. *carry an* inch, *and for* 12 inches *carry a* foot.

Observation upon the alteration of measures & weights

The measures and weights of Wooll, Salt, Cheese and Honey are not the same in some Countries as in others, and therefore in such cases you must conform your operation to the customes of those places.

Chap. III.

Of Subtraction.

Subtraction: 1 Of whol numbers.

I. *Subtraction is the taking of one number from another, whereby the residue, remainder or difference is found.*

II. *the number out of which the subtraction is to be made must be greater, or at least equall with the other.*

III. *In subtraction rank your numbers as in addition, and begin with the unites first:* So the numbers 3456 and

and 5678 being given to be ſubtracted the one out of the other, I order them as in the margent; then proceeding to the ſubtraction, I ſay 6 from 8 reſts 2, and 5 from 7 reſts 2, &c. and the difference between every figure of the lower and upper ranks I ſet down diſtinctly under its own place, as unites under unites, tens under tens, &c.

5678
3456
2222

IIII. *When any lower figure exceeds the upper (from which ſuch lower figure is to be ſubtracted) I borrow one from the next upper figure, which muſt be accounted* 10 *(becauſe every place exceeds the other ten, as by the* 4 *ſect. of the firſt chapt.) and for every* 10 *ſo borrowed I carry one to be added to the next lower figure, viz.* Admit I were to take 289 from 478, I firſt order thoſe two ſums as in the margent, drawe a lyne under them

478
289
189

them and ſay, 9 from 8 I cannot, but 9 from 18 reſts 9, which I ſet down under its proper place; then one I borrowed and 8 make 9 and 9 from 7 I cannot, but 9 from 17 reſts 8, which I ſet down under its proper place alſo; the one I borrowed and 2 make 3, and 3 from 4 reſts 1; ſo the reſidue, remainder or difference is found 189.

2 Of numbers having divers denominations.

V. *If the numbers propounded have divers denominations, when any figure of the upper number is leſſe then the figure of the lower, which is to be taken from it, you muſt borrow one from the next uppermoſt figure to increaſe it, and that one ſo borrowed, if from the place of pence (to be brought to the place of farthings) is to be accounted* 4, *if from the place of ſhillings* 12, *if from the place of pounds* 20, *and for every one ſo borrowed above, you add one to the next place belowe.*

EXAMPLE

EXAMPLE.

	l.	s.	d.	f.
lent	906	13	5	2
paid	198	17	9	3

	l.	s.	d.	f.
lent	906	13	5	2
paid	198	17	9	3
rests	707	15	7	3

3 Farthings from the penny I borrow rest 1, which added to the 2 farthings in the upper summe, make 3, to be placed below in the rank of farthings; then add that penny borrowed above to the 9 d. below, and say, 10 d. from 12 d. rests 2 d. which added to the 5 d. above make 7 d. to be set under the place of pence; then one shilling I borrowed added to the 17 s. say, 18 s. from 20 s. rests 2 s. which added to the 13 s. above, make 15 s. to be set down in the place of shillings; then one I borrowed and 8 make 9, and proceed as you were taught in the 1. sect. saying, 9 from 16 rests 7, and 10 from 10 rests 0, and 2 from 9 rests 7.

Other proof of Addition of integers *vide cap. 2 sect. 6.*

VI. *Addition is proved by Subtraction, and Subtraction by Addition: For when you have added divers numbers together, if you subtract one of them out of the summe, the remainder will be equall to the rest, as may be observed by the examples in the margent.* Here in the first example 5467 and 352 added, make 5819, then take 352 from 5819, there remaineth 5467 which is equall to the other number given to be added to 352, and the second example will be cleared by the first.

5467	5819
352	352
5819	5467

In like manner Subtraction is proved by Addition; for if you add the number given to be subtracted and the remainder together, the summe will be equall to the number out of which the subtraction is made, as appears by the last examples in the margent.

lent	789
paid	397
rest	391
proof	789

	l.	s.	d.	f.
lent	783	13	08	2
paid	397	15	10	3
reſt	385	17	09	3
proof	783	13	08	2

VII. *The proof now practiſed in Addition of divers denominations is thus, as will appear by the laſt example.* Cut off the uppermoſt number with the daſh of a pen, and add the remainders into one ſumme, then ſubtract the ſumme of the remainders from the totall, and there will remain the ſumme cut off: But I hold a diligent review of the work equall with this proof. Proof of Addition of divers denominations.

	l.	s.	d.
	78	13	10
	36	15	11
	54	18	10
	79	19	11
totall	250	08	06
ſum of the remainders.	171	14	08
remains the numb. cut off	78	13	10

Observation.

VIII. *If you lend severall summes at one, or severall times, & receive severall summes accordingly, the respective summes delivered are to be added into one grosse summe, and those received into another, and the payments, deducted out of the summes delivered, as in the following examples, which (together with the former) will render this rule familiar to every mean capacity.*

	℔.	s.	d.	f.
lent at times	787.	19.	11.	2
	578.	13.	10.	3
	789.	17.	10.	2
	578.	13.	11.	2
	789.	17.	11.	3
lent	3525.	03.	08.	0
paid	1196.	02.	06.	0
rest	2329.	01.	02.	0
proof	3525.	03.	08.	0

	℔.	s.	d.
paid at times	357.	10.	11
	259.	11.	10
	357.	18.	11
	220.	19.	10
	1196.	01.	06

	C.	qu.	℔.	℥
bought	9640.	1.	14.	10
sold	2951.	2.	17.	14
rest	5688.	2.	24.	12
proof	9640.	1.	14.	10

	C.	qu.	℔.	℥
grosse	88.	3.	21.	09
tare	59.	3.	26.	13
neate	28.	3.	22.	12
proof	88.	3.	21.	09

CHAP.

Chap. IIII.

Of Multiplication.

I. *Multiplication (which serveth for many additions) is that by which we multiply two numbers the one by the other, to the end their product may be discovered.* Wingate 29.

II. *Multiplication hath three parts, the Multiplicand, the Multiplicator, and the Product.* The parts of Multiplication.

III. *The Multiplicand is the number given to be multiplied.*

IIII. *The multiplicator is the number by which the Multiplicand is multiplied.*

V. *The Product is the number produced by the multiplication:* So if 6 be given to be multiplied by 4 the number produced is 24, for 4 times 6 is 24; here 6 is the multiplicand,

4 the Multiplicator, and 24 the Product.

VI. *Multiplication is single or compound.*

Single Multiplication.

VII. *Single Multiplication is when the Multiplicand and Multiplicator consist each of them of one figure only, as in the last example, the severall most necessary varieties whereof are expresst in the following Table.*

4		5		6		7		8		9	
4	16	4	20	4	24	4	28	4	32	4	36
5	20	5	25	5	30	5	35	5	40	5	45
6	24	6	30	6	36	6	42	6	48	6	54
7	28	7	35	7	42	7	49	7	56	7	63
8	32	8	40	8	48	8	56	8	64	8	72
9	36	9	45	9	54	9	63	9	72	9	81

The use of this Table is, Having one figure given to be multiplied by another, to know the product of them, finde the Multiplicand in the top of the Table and the Multiplicator on the left hand, and in every

place

place oppoſite to the Multiplicator, and under the Multiplicand is the product required, which will be obvious to the meaneſt capacity without further explanation; but before compound Multiplication can readily be wrought, the particular varieties in this Table muſt be learned by heart.

VIII. *Compound Multiplication is when the Multiplicator & Multiplicand, either one or both, conſiſt of moe figures then one.* *Wingate* 32.

IX. *In compound multiplication when the numbers end with ſignificant figures place them as in Addition and Subtraction:* So 3212 being given to be multiplied by 3, place them as in this example, and ſay thus, Three times 2 is 6, 3 times 1 is 3, 3 times 2 is 6, and 3 times 3 is 9, which you are to write under the ranks of your multiplying figures in order as you multiply, and Compound Multiplication

3212
3
9636

the whole multiplication will ſtand as you ſee in the margent before.

X. *When the Multiplicator conſiſts of more figures then one; for as many figures as it hath, ſo many ſeverall products muſt be ſubſcribed under the line, which at laſt being added into one ſumme gives you the totall product of all.* So 1232 being given to be multiplied by 23, the operation will ſtand thus, for the product of 1232 (multiplyed by 3) is 3696; again, 1232 multiplyed by 2, the product is 2464, which ſeveral products ſtanding in their due order (that is, the laſt figure of each product under his reſpective multiplying figure) and added together produce 28336, the product required. In like manner 1321 being given to be multiplyed by 123, the product is

1232	
23	
3696	
2464	
28336	
1321	
123	
3963	
2642	
1321	
162483	

162483, and the operation will also stand as you may see it in the margent before.

XI. *When the product of any particular figures amount to* 10 *write down* 0, *but when it exceeds ten, place the excess under the lyne, as before, & for every ten that it so exceeds keep one in minde to be added to the next rank.*

Example. 4564 being given to be multiplied by 54, the work will stand as in the margent; for 4 times 4 being 16, I write 6 the excesse under the line, and reserve one in minde, for the ten that it exceeds, to be added to the next rank; then 4 times 6 is 24, and 1 in minde is 25, therefore I subscribe 5 and carry 2 in minde; after which manner the rest of the work is performed, as you may see it in the example.

```
  4564
    54
 18256
-------
 22820
-------
246456
```

XII. *When the numbers given to be multiplied doe one or both of them end* *Wingate* 34, 35.

with

with cyphers, place their first significant figures towards the right hand one under another, and when the multiplication of the significant figures is finished, annex all the cyphers, after the number produced by the multiplication, which will give you the true product demanded: As appears by the examples following.

57893	57800
1200	13000
115786	1734
57893	578
69471600	751400000

XIII. *When in the Multiplicator cyphers are included between significant figures, multiply by the said significant figures, neglecting such cypher or cyphers, and observe to set each particular product in its due place,* according to the tenth rule of this chapter.

2543

2543	87643
304	2005
10172	438215
7629	175286
773072	175724215

Or otherwiſe, as in the following examples.

57834	32932
2003	2005
173502	164660
11566800	6586400
115841502	66028660

XIIII. *When a number is given to be multiplied with a number that conſiſts of an unite in the firſt place toward the left hand, and nothing but cyphers towards the right) ſuch as are* 10, 100, 1000, 10000, *&c.) the multiplication is performed by annexing the cyphers of the Multiplicator after the figures of the Multiplicand.* So if 5783 were to be multiplied by 1000, the product

See the 17 rule of the 5 chap.

duct would be found to bee 5783000.

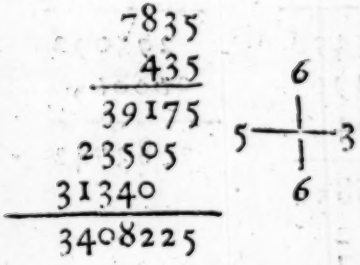
XV. *When three, or more numbers, are given to be multiplied together, they are ſaid to be multiplyed continually, and this kinde of multiplying is termed continuall multiplycation*: So if 5, 16, and 24 were given to be multiplyed continually, firſt 5 multiplied by 16 produceth 80. and 80 multiplied by 24 produceth 1920 the laſt product or number required and the work ſtands as in the margent.

16
5
80 *pr.* 1.
24
320
160
1920

XVI. *Multiplication may be proved by Diviſion, and Diviſion by Multiplication, as in chap.* 5. *rule* 20: *But being Diviſion may be more ſpeedily and as effectually proved by Addition, as in cap.* 5. *rule* 20. *and that the proof now practiſed in Multiplication is more*

eaſie

eaſie and ſpeedy, I here inſert it. Example.

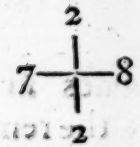


Caſt away the nines in the Multiplicator, and ſet the remainder 3 on the right ſide of the croſſe; then doe the like in the Multiplicand, and ſet the remainder 5 on the left ſide of the croſſe, multiply thoſe two together, caſt away 9, and ſet the remainder 6 at the head of the croſſe; then proceed and caſt away the nines in the product, and ſet 6 the remainder at the foot of the croſſe, and when thoſe two figures at head and foot agree, the work is true, elſe not.

Other

Other examples.

357928	73773
377	54
2505496	295092
2505496	368865
1073784	3983742
134929856	



It is convenient, in order to Division, &c. that the learner be perfect in the following Table.

2	times 12 is	24
3		36
4		48
5		60
6		72
7		84
8		96
9		108

Chap. V.

Of Division.

I. *Division is that by which we discover how often one number is contained in another.*

II. *Division hath three parts, the Dividend, the Divisor and the Quotient.*

III. *The Dividend is the number given to be divided.*

IIII *The Divisor is the number by which the Dividend is divided.*

V. *The Quotient, which discovers how often the Divisor is conteyned in the Dividend, is the number produced by the division.* So if 20 were the number given to be divided by 5, the number produced would be 4; for 5 is to be found 4 times in 20: and here 20 is the Dividend, 5 the Divisor, and 4 the Quotient.

VI.

The way how to work Division.

VI. *In Division make a crooked line at each end of the Dividend, that on the left hand serving for the place of the Divisor, and that on the right for the Quotient; then distinguish by a point or prick so many of the formost places of the Dividend as will contain the Divisor, which number so set apart, may for distinction sake be called the* * *Dividuall.*

* *vingate* 38.

So 37874592 being given to be divided by 48, set a prick under 8, because fewer places will not contain the Divisor, so is 378 the Dividuall.

48)37874592

VII. *Having thus prepared the numbers, Ask how often the Divisor is contained in the Dividuall, and place that which answers the question in the quotient, and multiply the Divisor by that particular quotient, and subtract the product from the dividuall, setting down the remainder.*

Thus ask how often 48 is contained in 378, and since to answer

ſwer this queſtion (and ſuch like) there is a neceſſity of * tryall, it is requiſite that you fitly begin your triall, *viz.* If the diviſor and dividuall conſiſt of equall places, ask how often the firſt figure of the diviſor toward the left hand is contained in the firſt figure of the dividuall towards the left; but if the dividuall conſiſt of one place more then the diviſor (as here it doth) ask how often the firſt figure of the diviſor is contained in the two formoſt places of the dividuall, *viz.* ask how often 4 is contained in 37, but obſerve that 4 is to be taken but ſuch a number of times out of 37, as 8 may the like number of times be taken out of the remainder; therefore 8 times 4 I cannot, becauſe 8 times 8 cannot be taken out of * 58 the remainder; therefore make tryall of 7, which is

*tringate 39.

The diviſor and dividuall of equall places.

Dividuall of more places then the diviſor.

* Every unite remaining when another figure ſucceeds, to which it may be joyned, is accounted 10. So if 8 times 4 be taken out of 37, there remains 5, which is accounted 50, becauſe 8 the third figure of the dividuall ſucceeds, to which it is to be added and reputed 58.

the greatest number of times 4 can be taken, (* never take above 9 times in any triall) which shews that 48 may be taken out of 378 seven times and no more; then set 7 in the quotient, and multiply that into the divisor and set the product under 378 the dividuall, then draw a line under the product, and subtract the same from the dividuall, so is the remainder 42.

* Though the first part of the divisor may sometimes be found more then 9 times in the correspondent part of the dividuall, yet the whol divisor cannot be found more then 9 times in the whole dividuall, as in *wingate* 42.

```
48)37874592(7
  336
  ----
   42
```

When it doth not give you a new dividuall (as being lesse then the divisor) proceed accor ding to the 12 rule.

VIII. *Set a point under the next place of the dividend, & transcribe the figure or cypher standing in that place after the remainder, which here gives you a new dividuall*

```
48)37874592(7
  336
  ----
   427
```

all.: So 7 being transcribed after 42, the dividuall is 427, and the work will stand as in the margent before.

IX. *Renew the question, and proceed according to the seventh rule, viz.* Seek how often 48 may be found in 427, which will be 8 times, for there is 8 times 4 out of 42, and 8 times 8 may be taken out of the remainer, therefore place 8 in the quotient, and multiply it into the divisor, place the product under the last dividuall, draw a line, and subtract the product from the said dividuall, the remainder is 43, and the work stands as in the margent.

```
48)37874592(78
   336
   ---
   427
   384
   ---
    43
```

X. *Proceed according to the eighth rule of this chapter, in pricking and transcribing the next figure of the dividend, and the new dividuall will*

be found 434, as by the example in the margent

```
48)37874592(78
 336
 ---
  427
  384
  ---
  434
```

XI. *Repeat the question, and proceed according to the seventh rule of this chapter*, And you will find 9 times 4 in 43, for so many times 8 may be found in the remaynder, then 9 multiplied into the divisor and the product subtracted from the last dividuall, the remainder will be 2.

```
48)37874592(789
 336
 ---
  427
  384
  ---
  434
  432
  ---
    2
```

XII. *Repeat the question, and proceed according to the eighth rule in prick*

ing & transcribing the next figure of the dividend after the remainer, & the number which should be the new dividuall will be found 25; but because the divisor 48 is greater then 25, place a cypher in the quotient, and then prick and transcribe the next figure and the new dividuall will be found 259.

```
48)37874592(7890
 336
 427
 384
 434
 432
 259
```

XIII. *Repeat the question, and proceed in every respect as before untill the whole work be finished,* which will stand as in the margent, and the quotient required will be found 789054

```
48)37874592(789054
 336
 427
 384
 434
 432
 259
 240
 192
 192
```

Vide 7 rule in this chapter.

XIIII. *When the divisor and dividuall consist of equall places proceed as in this example.*

25)80850(3234
75
58
50
85
75
100
100

XV. *So often as the question is repeated in division, so many places must there be in the quotient, which may be discovered by the number of points placed under the Dividend, and so many severall operations are there in the whole work, which you are to continue till the last place of the dividend be transcribed,* as is evident by the former and following examples.

XVI. *When after the whole work is finished, any figures remain of the last subtraction, they are the numerator of a fra-*

fraction, which hath the divisor for its denominator, and is to be annexed to the quotient, as the broken part thereof; which fraction expresseth certain parts (or at least a part) of an integer, which is alwaies of the same denomination with the quotient. So if 3734 crownes were to be distributed amongst 32 soldiers, the part allotted to each would be $116\frac{22}{32}$, that is, 116 crowns and 21 parts of a crown it being divided into 32 parts; for 3734 being divided by 32, the quotient is $116\frac{22}{32}$, as appears by the work. But to finde the value of the said $\frac{22}{32}$ of a crown, or of any other fraction, see the 7 rule of the 7 chapter.

32)3734(116$\frac{22}{32}$
32
53
32
214
192
22

Wingate 43.

XVII. *When the Divisor consists of an unite in the first place towards the left*

hand, and nothing but cyphers toward the right, the division is performed by cutting off so many places of the dividend towards the right hand as the divisor hath cyphers, which figures so cut off, are the numerator of a fraction, which hath for denominator the divisor given. So if 578300 were given to be divided by 1000, the number required by the division is $578\frac{300}{1000}$.

1000)578|300

XVIII. *When the divisor consists of any significant figure or figures in the first place (or more of the formost places) towards the left hand, and nothing but cyphers towards the right, cut off so many places of the dividend towards the right hand as the divisor hath cyphers towards the same, and divide the dividend remaining on the left hand, by the remaining part of the divisor when the cyphers are omitted, remembring after the division is ended to restore as well the cyphers to the divisor, as the places cut off*

to the dividend. So if 7456787 were given to be divided by 304000, the quotient will be found 24; for if you cut off 3 places of the dividend towards the right hand (because the 3 last places of the divisor are cyphers) and divide the remaining part of the dividend, *viz.* 7456 by 304, the quotient will be found 24. Also, if unto 160 the remainder of the last subtraction, you restore the places of the dividend cut off towards the right hand, *viz.* 787, there will be 160787 for the numerator of a fraction, whose denominator is the whole divisor, *viz.* 304000.

304000)7456|787(24$\frac{160787}{304000}$
608
1376
1216
160

XIX *When the dividend is lesse then the divisor, place the dividend as the numerator of a fraction, and the divisor*

as

as denominator, and such fraction is the quotient sought. So if 6 l. sterling were to be divided amongst 8 men, each mans proportion would be $\frac{6}{8}$ or $\frac{3}{4}$, that is, as will be manifest by the 7 rule of the 7 chapter, 15 s.

The proof of Multiplication and Division.

XX. *Division and Multiplication doe interchangably prove one another; for in division if you multiply the divisor by the quotient, and to the product add the remains, the product will be equall to the dividend.* So first in the example ot the 13 rule of this chapter 48 the divisor being multiplyed by the quotient 789054, the product 37874592 will be equall to the dividend.

Secondly, In the example of the 16 rule of this chapter 488 being multiplyed by 275, and 122 the remains added to the product, the sum is 134322 the dividend.

Again, in Multiplication the product being divided by the multiplicator the quotient will give you the multiplicand.

So

So in the example of the 16 rule of the last chapter 3408225 the product, being divided by 435 the multiplicator, the quotient gives you 7835, the multiplicand; the effectuall observation whereof tending much to the advantage of the learner, in the rules of this chapter; for the better illustration thereof, I have framed the 4 following examples.

First

35789
6

6|214734

35789

Second

78978
48

631824
315912

48)3790944(78978
336
430
384
469
432
374
336
384
384

Fourth

```
                third                fourth
357 )281308146(787978                78757
     .2499                             304
     -----                           ------
      3140                           315028
     .2856                          236271
     -----                         ------
      2848                  304)23942128(78757
     .2499                        .2128
     -----                        -----
      3491                         2662
     .3213                        .2432
     -----                        -----
       2784                        2301
      .2499                       .2128
      -----                       -----
        2856                        1732
       .2856                       .1520
     ---------                     -----
     281308146                      2128
     ---------                     .2128
                                 -------
                                 23942128
                                 -------
```

To prove Division by Addition.

This kinde of Division may likewise be proved by Addition; for if the severall products arising from the multiplication of the divisor by each particular quotient,

quotient, and the remainer of the laſt ſubtraction (when there is any) be added together in the ſame order of ranks as they are placed in the diviſion, the ſum will be equall to the Dividend. So in the third example of this rule if the ſeverall products (which for the learners eaſe I have pointed on the left hand, *viz.* .2499, .2856, .2499, .3213, .2499, .2856) be added together in the ſame order of ranks as they are placed in the diviſion, the ſumme will be found the ſame with the dividend; and the like in the fourth example.

In the third and fourth examples you finde 7 three ſeveral times in the quotient, and that 2499 in the third example, is the product of 7 multiplied into the diviſor, 7 being the firſt figure of the quotient toward the left hand; therefore when you come to ſeven again in the third place and likewiſe in the fifth, you may ſpare the pains of multiplying

7 into

7 into the divisor, and only transcribe the product 2499 in those two places: The like in the fourth example; for the product in the first place is 2128, and so in the third and fifth.

First, this one conveniency in this division is accompanied with the following; as,

Secondly, Not one figure is defac'd or cancelled in the whole work, wch may be laid aside and reassumed at pleasure when a part is ended, without beginning the operation anew.

Record 114, saith this form of Division was practised by that learned Mathematitian Mr. *Hen. Briggs*, from whom he learned it. Mr. *Wingate*, Mr. *Kersey*, Mr. *Moore*, and other able Mathematitians have since publiquely approved it.

Thirdly, The dividend after multiplication, being not transcribed from place to place, as in other kindes of Division, the operations are continued in decent order, as is evident in all the following rules though more especially in Reduction, Practise and Fellowship; and,

Fourthly, The proof by Addition

is

is farre more eaſie and ſpeedy then by multiplication, which proof by Addition other kindes of Diviſion doe not admit of.

XXI. *Two particular ſpecies of Diviſion are Bipartition and Tripartition.* Bipartition and Tripartition.

XXII. *Bipartition, otherwiſe called Mediation, is diviſion by* 2.

XXIII. *Tripartition is Diviſion by* 3.

XXIIII. *In Bipartition and Tripartition ſubſcribe the quotient under the dividend (or where you pleaſe) either ſetting down or omitting the diviſor at pleaſure.*

XXV. *Bipartition, Tripartition, Quadripartition, &c. conducing much to the advantage of the learner in all the rules of Arithmatique, eſpecially in thoſe of Reduction and Practiſe, I have ſet down the following examples, which are moſt neceſſary to be obſerved.* See the obſervation upon the latter part of the ſeventh rule, where every unite remaining when another figure ſucceeds, to which it is to be joyned, is accounted to.

The

The half of 3 is 1, the half of 18, 9; the half of 3, 1; the half of 10, 5; the half of 7, 3; the half of 18, 9; the half of 0, 0; the half of 4, 2; so is the quotient 19153902. Or thus: Once 2 in 3, 9 times 2 in 18, &c.

2)38307804

19153902

Now once 3 in 3, twice 3 in 8 rests 2, which is reputed 20 (as before,) 7 times 3 in 23, 6 times 3 in 20, 9 times 3 in 27, twice 3 in 8. 6 times 3 in 20, 8 times 3 in 24, so is the quotient 12769268: *& sic de cæteris.*

3)38307804

12769268$\frac{1}{3}$

4)38307804

9576951

5)38307804

7661560$\frac{4}{5}$

6)38307804

6384634

12)38307804

3192317

CHAP.

Chap. VI.

Of Reduction of Integers from one denomination to another.

I. BY *denominations* are here understood the particular species of monie, weight, measure, time, &c. So a pound sterling, a shilling, a penny, a farthing, are the particular species or denominations of monie used in *England*, as may appear by the 24 rule of the first chapter. Also a pound, an ounce, a penny weight, a grain, are the particular denominations of *Troy* weight, as may appear by the 25 rule of the first chapter. And the like is to be understood of *Averdupois* weight, measures, time, &c. whose particular species or denominations

Reduction of Integers from one denomination to another.

Vide latter part 24 rule ch. 1.

nominations are expreſſed in the tables of the firſt chapter: And as pounds are of a greater denomination then ſhillings, ſo ſhillings then pence, and pence then farthings; and the like in weight, *viz.* in *Averdupois* weight, as hundreds are a greater denomination then quarterns, ſo quarterns then pounds, and pounds then ounces, &c. and the like in meaſure, time, &c. which ought to be well obſerved becauſe all great denominations are reduced to ſmall by Multiplication, and all ſmall to great by Diviſion, as will be more evident by the tables and examples following.

		Multiply by		
Pounds at one operation reduced	to ſhillings	20	ſhillings to pounds	2
	to pence	240	pence to pounds	24
	to half-pence	480	half-pence to pounds	48
	to farthings	960	farthings to pounds	96
Shillings reduced	to pence	12	pence to ſhillings	1
	to half-pence	24	half-pence to ſhillings	2
	to farthings	48	farthings to ſhillings	4

		Multiply by		*Divide by*
Pence	*to farthings*	4	*farthings to pence*	4
Pounds	*to groats*	60	*groats to pounds*	60
Shillings	*to groats*	3	*groats to ſhillings*	3
Groats	*to pence*	4	*pence to groats*	4
	to farthings	16	*farthings to groats*	16
Pounds	*to nobles*	3	*nobles to pounds*	3
	to marks	3		
	and divide by	2		
Marks	*to pounds*	2		
	and divide by	3		
	to pence	160	*pence to marks*	160
Nobles	*to pence*	80	*pence to nobles*	80

II. Though it be evident by the Table, that pounds may be reduc'd to pence, half-pence or farthings, &c. at one operation, yet (in reſpect the proving of every queſtion by Diviſion in ſmalleſt numbers will be of moſt eaſe) the following method is obſerved in favour to the learner.

Reduce

Reduction of monie. They that can multiply 12 readily by any of the 9 digits may observe the other method, where no multiplicand is set down.

Reduce 863 li. sterling to pence, thus

li.
863
20
17260 *shill.*
12
34520
1726
12|207120 *pence*
20|1726|0 *shillings*
863 *pounds, for proof*

li.
863
17260 *shillings*
12|207120 *pence*
2|1726|0 *shillings*
863 *li. for proof*

Reduce 863 li. sterling to half-pence, thus

20
17260 *shillings*
12
34520
17260
207120 *pence*
2
2|414240 *half-pence*
12|207120 *pence*
*2|1726|0 *shillings*
863 *pounds*

* Dividing by 20 (according to the 18 rule of the 5 chap.) is to cut off the last figure or cypher of the dividend, & to half the remainer.

Reduc

li. s. d. f.

Reduce 978-17-8-3 sterl. to farthings, thus

20

19577 *shillings*

12

39162

19577

234932 *pence*

4

4|939731(3 *farthings*

12|234932(8 *pence*

2|1957|7(17 *shillings*

978 li. 17 s. 8 d. 3 f. *for proof*

Set the remains in a smaller character, and distinguish them by a stroke at the end of each respective denomination, as in this example.

Reduce 90609 marks Engl. to pounds, thus

2

3|181218 *nobles*

60406 *pounds*

3

2|181218 *nobles*

90609 *marks*

Multiply by

Hundreds to quarters—	4
Quarters to pounds—	28
Pounds to ounces—	16
Ounces to drams—	8
Dramms to ſcruples—	3
Scruples to grains—	20

Divide by—

quarters to hundreds—	4
pounds to quarters—	28
ounces to pounds—	16
drams to ounces—	8
ſcruples to dramms—	3
grains to ſcruples—	20

Reduction of weight *Averdupois.*

Reduce 90-3-21 to ounces, thus.

C. qu. lb.		C. qu. lb.
4		4
363 *quarterns*		363 *qu.*
28		28
2905		2905
728		728
10185 *lb.*		10185 *lb.*
16		16
16 | 162960 *ounces*		61110
28 | 10185 (21 *lb.*		10185
4 | 363 (3 *quarters*		162960 *ounces*
90 C.		

If the leſſner be of capacity to divide by 16 & 28 at one operation, the proof of the work will ſtand decently, as in this example, otherwiſe not.

Reduce

℔. ℥ ʒ ℈

Reduce 12–7–5–2 to gr. thus,

16

79

12

199 *ounces*

8

1597 *dramms*

3

4793 *ſcruple*

20

2|9586|0 *grains*

3|4793(2 *ſcruples*

8|1597(5 *drams*

16|199(7 *ounces*

12 *pounds*

C. qu. lb.

In 4 chefts of fugar, each 7–3–12 groſs, how many pound neat? 4

31
28

250
63

880 *pounds*
4 *Chefts*

4|3520 *pounds neat*

28|880(12 *pounds*

4|31(3 *quarters*

7 C.

In 88 C.

In 88 C. 3 qu. 19 ℔. groſs, tare 3 C. 3 qu. there will be found 9539 ℔. neat.

Tare is that where in any thing is pur, as a bag for Pepper, a cheſt for Sugar, &c.

C. qu. ℔.
88–3–19 *groſs*
3–3 *tare deducted*

85–0–19 *remains*
4

340 *qu.*
28

2729
681

28|9539(19 *lb. neat,*
4|340 *qu.*
85 *C.*

which may alwaies be divided by 112, *if the learner pleaſe.*

In 4 Cheſts of Sugar (weight groſs, tare 37 ℔. *per* Cheſt) will be found 43 C. 5 ℔. neat.

	C.	qu.	℔.
viz. A.	11	1	19
B.	10	3	20
C.	11	2	13
D.	10	1	17

In

In 990 C. 3 qu. 21 ℔. groſs, tare 14 ℔. *per cent.* how many C. neat?

C. qu. ℔.
990—3—21
4
3963
28
31705
7928
8|110985 *groſs*
13873 *tare, which is to be ſubtracted from the groſs*
28|97112(8 *neat*
4|3468

Anſwer — 867 *C.* 0 *qu.* 8 *lb. neat.*

See the ſame queſtion more conciſely wrought in chap. 10 rule 9.

III. *When the allowance for tare is an aliquot part of* 112, *you may obſerve the order of this example:* Where for 14 lb. *per cent.* tare, I take $\frac{1}{8}$ of the groſs, becauſe 8 times 14 is 112.

IIII. *If the tare be not an aliquot part*

part of 112, *you may make one or more products, and then add or ſubtract as you finde occaſion, viz.*

For 12 lb. *per cent.* tare, take $\frac{1}{8}$ of the groſs (as admitting it 14 *per cent.*) then having taken for 2 pounds above your proportion take $\frac{1}{7}$ of that product, becauſe twice 7 is 14, and ſubtract the $\frac{1}{7}$ from the $\frac{1}{8}$, the remains will be the tare. For 18 lb. *per cent.* tare, take $\frac{1}{7}$ of the groſs (as admitting it 16) then having taken for 2 lb. leſs then your proportion, take $\frac{1}{8}$ of that product for the remaining 2 lb. (twice 8 being 16) and add both products together, the totall will be the tare.

For 20 lb. *per cent.* tare, take $\frac{1}{7}$ of the groſs (as admitting it 16 *per cent.*) then for the 4 lb. remaining, take $\frac{1}{4}$ becauſe 4 times 4 in 16, and add both products, the totall will be the tare, &c. Or you may multiply the groſs by the number allowed for tare, and divide the product by 112,

and

and the quotient gives the tare.

In 3 baggs of Pepper weighing groſs 34 C. 3 qu. 16 ℔. tare 12 ℔. *per* bagg, and 4 *per* 104 trett, how many C. neat?

	C.	qu.	℔.
n° A.	11	3	12
n° B.	12	1	13
n° C.	10	2	19
	34	3	16

4

139
28

1118
279

3908 *groſs*
36 *tare*

3872 *ſubtile*
148 *trett*

28|3724 *neat*

4|133

Anſwer—33 *C.* 1 *qu.* 0 *lb.*

26)3872(148
26

127
104

232
208

24

The lb. ſubtil are divided by 26; becauſe 4 times 26 is 104, to finde the Trett.

Ten

Ten Barrells of Indico weighing groſs, *viz.*

	C.	qu.	lb.	*Tare* lb.	z
1	3	2	25	45	08
2	3	1	27	43	04
3	3	3	08	39	12
4	3	1	23	38	08
5	3	0	26	42	00
6	3	1	15	40	08
7	3	2	18	37	04
8	3	3	17	38	12
9	3	0	24	39	00
10	3	1	19	43	08
	35	1	06	408	00

4

141
28

1134
282

3954
408 *tare*

28|3546(18
4|126(2

31 *C.* 2 *qurs.* 18 *lb. neat* 78 lb.

Reduction of *Troy* weight.

lb. ʒ dw.

Reduce 78 — 10 — 7 to grains, thus

12

156

79

946 *ounces*

20

18927 *penny weight*

24

75708

37854

24|454248 *grains*

2|1892|7(7 *penny weeght*

12|946(10 *ounces*

78 *lb. for proof.*

Years

	Multiply by		Divide by
Years to dayes	365	*dayes to years*	365
Dayes to hours	24	*hours to dayes*	24
Hours to minutes	60	*minutes to hours*	60

Reduction of time.

years dayes houres minutes

178—12—18—11 reduced to (minutes, thus;

365

892

1069

534

64982 *dayes*

24

259936

129965

1559586 *houres*

60

6|9357517|1(11 *min.*

24|1559586(18 *houres*

365|64982 *dayes* (178 *years*

365

2848

2555

2932

2990

12 *dayes.*

Tunns

Reduction of liquid measures.

Multiply by		Divide by	
Tunns to Butts	2	Butts to Tunns	2
Tunns to hh.	4	hogsheads to tunns	4
Butts to hogsheads	2	hogsheads to butts	2
Hogsheads to gall.	63	gallons to hh.	63
Gallons to pottles	2	pottles to gallons	2
Pottles to quarts	2	quarts to pottles	2
Quarts to pints	2	pints to quarts	2

Tuns hh. gal. pot qrs.

Reduce 24–2–20–1–1 to pints, thus:

4
99
63
317
494
6257 gallons
2
12515 pottles
2
25031 quarts
2
2|50062 pintes
2|25031 quarts(1
2|12515. pottles(1
63|6257 gallons(20
4|99 (3 hh.
24 tunns

Forraign

Forraign long measures compared with the English yard.

Reduction of cloth measure.

The number of nails contained in these measures

- 12 { *a Portugall Cavada for wollen* / *a Flemmish Aulne or Ell.*
- 15 { *a Spanish Vare.*
- 16 { *an English Yard.*
- 19 { *a Portugall Vare.* / *the long measure of Paris.*
- 20 { *an English ell.*
- 24 { *the French Aulne.* / *the Welch Goad.*

		Multiply by	Divide by
To reduce	*Portugall Cavadoes, or Flemish ells, to Spanish Vares*	4	5
To reduce	*Spanish Vares to Port. Cavad. or Flemish Ells*	5	4
To reduce	*Flemish Ells to English Yards*	3	4
To reduce	*English Yards to Flem. Ells*	4	3
To reduce	*Flemish Ells to English*	3	5
To reduce	*English Ells to Flemish*	5	3
To reduce	*English Ells to Yards*	5	4
To reduce	*English Yards to Ells*	4	5

The like method may be compo-

ſed for reduction of any one meaſure to another, when the number of nails, &c. may be abreviated or parted by 3, 4, 5, 6, &c.

Example.

A Portugall Cavadoe containing — 12
A Spaniſh Vare containing — 15
} *nails* {
there is 4 *times* 3 *in* 12.
there is 5 *times* 3 *in* 15.

Therefore *Portugall* Cavadoes to Flemiſh ells, multiply by 4, divide by 5; *& e contrà* Flemiſh ells to *Portugall* cavadoes, multiply by 5, divide by 4. Again,

The French Auln cont 24
The Engliſh Ell cont. 20
} *nayls* {
6 *times* 4 *is* 24.
5 *times* 4 *in* 20.

Therefore French aulns to Engliſh ells, multiply by 6, divide by 5; *& e contrà* Engliſh ells to French aulns, multiply by 5, divide by 6, *& ſic de cæteris.* There are other rules, but I ſhall not inſiſt upon them (becauſe theſe are the conciſeſt) ſave only the following generall rule, which

which, if the learner finde more easie, he may accept, and reject the former, *viz.*

Multiply the measure given, by the nails of the said measure, and divide the product by the number of nails which are in that measure unto which you would reduce them, viz.

How many Englisſh yards in 120 Flemiſh ells?

ells Flemiſh

120

Anſwer, 90 yards. 12

16|1440

90 yards Engl.

How many Flemiſh ells in 90 Engliſh yards?

yards Engliſh

90

Anſwer 120. 16

12|1440

120 *Flemiſh ells.*

Chap. VII.

Of Reduction of Fractions.

See the definition of fractions in the first chap.

I. He ſame parts of Arithmatique, *viz.* Addition, Subtraction, Multiplication, and Diviſion, which have been wrought in whole numbers by the 2, 3, 4, and 5. chapters, are likewiſe to be performed in broken numbers (otherwiſe called parts or Fractions) but I ſhall only mention ſuch parts as are materiall.

II. *When the numerator and denominator are even numbers, they may be meaſured, parted, halfed, or divided by* 2; *therefore in ſuch caſe, you may (as is taught in the* 25 *rule of the* 5 *chapter) take the half of the numerator for a new numerator, alſo the half of the denominator for a new denominator.*

So

So if $\frac{32}{128}$ be given, draw at length the line which separates the numerator from the denominator, and crosse the same with a down right stroke neer the fraction, as you see in the margent; then take the half of 32, which is 16, for a new numerator, and 64, the half of 128, for a new denominator; again, the half of 16 is 8, and the half of 64 32; and proceeding in like manner, there will be found $\frac{1}{4}$, which is equivalent unto $\frac{32}{128}$.

32	16	8	4	2	1
128	64	32	16	8	4

By the 7 rule of this chap. you may finde $\frac{1}{4}$ equivalent to $\frac{32}{128}$ for $\frac{1}{4}$li. sterling is 5 s. which is equivalent to $\frac{32}{128}$li.

III. *When the numerator and denominator doe each of them end with* 5, *or one of them with* 5, 8, 12, *&c. and the other with a cypher, they may be measured or divided by* 5. So $\frac{225}{475}$ will be reduced into $\frac{9}{19}$, and $\frac{50}{425}$ into $\frac{2}{17}$, as by the operation in the margent is manifest.

225	45	9
475	95	19

50	10	2
425	85	17

IIII. *Many times when the numerator & denominator end with 9,3,7,or 1,&c. you may measure or devide the numerator and denominator by 3, 7, 9, 11 &c. as in the following example,* where,

1 $\frac{729}{1701}$ measured, parted, or divided by 3 gives $\frac{3}{7}$, wch is equall in value to $\frac{729}{1701}$.

1) 729|243| 81|27| 9|3
1701|567|189|63|21|7

2 $\frac{343}{2401}$ parted by 7, gives $\frac{1}{7}$, which is equivalent to $\frac{343}{2401}$.

2) 343| 49| 7|1
2401|343|49|7

3 $\frac{729}{6561}$ parted by 9, gives $\frac{1}{9}$, which is equivalent unto $\frac{729}{6561}$. See the severall operations in the margent.

3) 729| 81| 9|1
6561|729|81|9

V. *Whensoever you can espy any other number which will exactly measure the numerator and denominator, you may by such number divide the numerator and denominator.* So $\frac{28}{84}$ may be first reduced

duced into $\frac{7}{21}$ by 4, and $\frac{7}{21}$ may be reduced into $\frac{1}{3}$ by 7; as is manifest by the operation. Also $\frac{16}{48}$ may be reduced into $\frac{1}{3}$, *viz.* once 16 in 16; and so 1 is numerator; and 3 times 16 in 48, so is 3 denominator, which shews $\frac{1}{3}$ equivalent to $\frac{16}{48}$.

28|7|3
84|21|7

16|1
48|3

VI. *When the numerator and denominator doe each of them end with a cypher or cyphers, cut off equall cyphers in both, so will the fraction be reduced into lesser terms.* So will the fraction $\frac{200}{300}$ be reduced into $\frac{2}{3}$, and $\frac{200}{3000}$ into $\frac{2}{30}$, which may, by the second rule of this chapter, be reduced to $\frac{1}{15}$, which is equivalent to $\frac{200}{3000}$.

2|00
3|00

2|00
30|00

VII. *The value of a single fraction in the known parts of the integer may be* To finde the value of a single

fraction in the known parts of the integer.

found in this manner, viz. multiply the numerator of the fraction propounded by the number of the known parts of the next inferiour denomination, which are equall to the integer, and divide that product by the denominator, so is the quotient the value of the fraction in that inferiour denomination; and if there happen to be any fraction in the quotient, you may finde the value thereof in the next inferior denomination, by the same rule, & so proceed till you come to the last known parts.

So the value of $\frac{49}{64}$ of a pound sterling will be found 15 s. 3 d. 3 f. *viz* multiply 49, the numerator, by 20 (the number of

$$\begin{array}{r} 49 \\ 20 \\ \hline 64)980(15\tfrac{20}{64}\text{s.} \\ 64 \\ \hline 340 \\ 320 \\ \hline 20 \\ 12 \\ \hline 64)240(3\tfrac{48}{64}\text{d.} \\ 192 \\ \hline 48 \\ 4 \\ \hline 64)192(3\text{ f.} \\ 192 \\ \hline \end{array}$$

shillings

ſhillings which are equall to a pound ſterling) the product is 980, which being divided by the denominator 64, the quotient is 15 $\frac{20}{64}$s. In like manner the value of $\frac{20}{64}$ of a ſhilling will be found 3 pence; for multiplying the numerator 20 by 12 (the number of pence in a ſhilling) the product is 240, which being divided by 64 the denominator, the quotient is 3 $\frac{48}{64}$ d. then the numerator 48 being multiplyed by 4 (the number of farthings in a penny) & divided by 64, the denominator, the quotient is 3 farthings.

The value of $\frac{111}{448}$ of 112 lb. (that is of a hundred *Averdupois*) will be found equivalent to 1 qu. 24 lb. 12 $\frac{3}{3}$

The value of $\frac{113}{360}$ of a pound *Troy*, will be found equivalent to 3 $\frac{3}{3}$. 15 dw. 8 gr.

Alſo $\frac{415}{1008}$ of a Tunn will be found 1 hh. 40 gall. 3 quarts.

VIII. *A mixt number may be reduced*

To reduce a mixt number into an improper fraction.

ced into an improper fraction equivalent unto the mixt number, in this manner, viz. *multiply the whole number by the denominator of the fraction, and unto the product add the numerator, ſo is the ſum the numerator of an improper fraction, whoſe denominator is the ſame with that of the ſaid fraction annexed.*

See the 22 fect. ch. 1.

So $3\frac{4}{5}$ will be reduced into the improper fraction $\frac{19}{5}$ for 5 being multiplyed by 3, the product is 15, unto which adding 4, the numerator, the ſumm is 19 for a new numerator, which being placed over the denominator 5, gives the improper fraction $\frac{19}{5}$, which is equivalent unto $3\frac{4}{5}$, as will appear by the rule next following.

To reduce an improper fraction into its equivalent whole or mixt number.

IX. *An improper fraction may be reduced into its equivalent whole or mixt number, in this manner,* viz. *divide the numerator by the denominator, and the quotient gives the whole number or mixt number ſought.* So the improper fraction $\frac{19}{5}$ in the rule aforegoing will be

be reduced into the mixt number $3\frac{4}{5}$, for if 19 be divided by 5 the quotient is $3\frac{4}{5}$. Also the improper fraction $\frac{68}{4}$ will be reduced into the whole number 17.

X. *A whole number is reduced into an improper fraction by placing the whol number given as a numerator, and* 1 *as denominator.* So 18 integers will be reduced into the improper fraction $\frac{18}{1}$ and one integer into the improper fraction $\frac{1}{1}$. To reduce a whole number into an improper fraction.

XI. *A compound fraction (otherwise called a fraction of a fraction) may be reduced into a single fraction in this manner,* viz. *multiply all the numerators continually, so is the product a new numerator; Also multiply all the denominators continually, so is the product a new denominator.* Thus if the compound fraction $\frac{2}{3}$ of $\frac{3}{4}$ be given to be reduced into a single fraction, multiply the numerators 2 and 3 one by the other the product is 6, for a new numerator; also multiplying 3 and 4 one by the To reduce a compound fraction to a single fraction. See continuall multiplication in the 15 rule of the 4 chap.

the other, the product is 12, for a new denominator; so is $\frac{16}{12}$ or $\frac{4}{3}$ the single fraction sought, being equivalent unto $\frac{2}{3}$ of $\frac{3}{4}$, the compound fraction given to be reduced.

Chap. VIII.

Of Addition of Fractions.

Addition of single fractions, when they have equall denominators.

When the terms given to be added are single fractions, and have a common denominator, add all the numerators together, so is the sum the numerator of a fraction, whose denominator is the same with the common denominator, which new fraction is the summ of the fraction given to be added.

So $\frac{4}{8}$ and $\frac{2}{8}$ being given to be added, their summ will be found $\frac{6}{8}$, *viz.* the summ of the numerators 4 and 2 is 6, which being placed over the common

common denominator 8 gives $\frac{6}{8}$. In like manner the ſumm of theſe fractions $\frac{5}{8}$ $\frac{4}{8}$ $\frac{6}{8}$ will be found $\frac{15}{8}$, which, by the 9 rule of the 7 chapter, will be found equivalent unto $1\frac{7}{8}$: ſo that $1\frac{7}{8}$ is the ſumme of the fractions given to be added. And the ſumme of $\frac{45}{515}$, $\frac{35}{515}$, and $\frac{435}{515}$ q will be found $\frac{515}{515}$, which is a q.

See the proof of the firſt example of the 14 ch.

Chap. IX.

Of Subtraction of Fractions and Mixt numbers.

I. *When the tearms given are both ſingle fractions and have a common denominator, ſubtract the leſſer numerator from the greater, and place the remainder over the common denominator, ſo is ſuch new fraction*

The ſubtraction of ſingle fractions, when they have a common denominator

fraction the difference between the fractions given. Thus the difference between the fractions $\frac{11}{12}$ & $\frac{7}{12}$ is $\frac{4}{12}$. Also the difference between $\frac{9}{127}$ & $\frac{21}{27}$ is $\frac{2}{27}$

A whole number from a mixt number.

II. *When a whole number is given to be subtracted from a mixt number, subtract the said whole number from the whole part of the mixt number, and unto the remainer annex the fractionall part of the mixt number given, so is the mixt number thus found the remainder or difference sought.* As if 9 be given to be subtracted from $22\frac{5}{6}$, the remainder or difference will be found $13\frac{5}{6}$.

A mixt number from a whole number.

III. *When a mixt number is given to be subtracted from a whole number, subtract first of all the fractionall part of the mixt number from an integer borrowed from the whole number given, and set down the remaining fraction; then adding the integer borrowed unto the integers of the mixt number, subtract the said sum from the whole number given; so that which remains, together with the remaining fraction, before found, is the remainder*

remainder or difference ſought. * So 2 li. $3\frac{11}{13}$ s. ſubtracted from 20 li. the remainder or difference will be found 17 li. 1 s. $\frac{2}{13}$.

* See the confutation of Mr. *Melly's* his rule in the chap. of Rebate.

IIII. *When a fraction is given to be ſubtracted from an integer, ſubtract the numerator from the denominator, and place that which remains over the denominator, which new fraction thus found is the remainder or difference ſought.* So $\frac{2}{3}$ being ſubtracted from an integer or one, the remainder is $\frac{1}{3}$, and $\frac{6}{21}$ ſubtracted from 1, the remainder or difference will be found $\frac{15}{21}$.

Chap. X.

Of Multiplication of Fractions, and mixt numbers.

I. *When the terms given are ſingle fractions, multiply the numerators one by the other, ſo is the product a new nume-*

To multiply ſingle fractions.

numerator; Also multiply the denominators one by the other, so is the product a new denominator, which new fraction is the product sought. So $\frac{5}{8}$ and $\frac{16}{140}$ being given to be multiplyed, the product will be $\frac{80}{1120}$.

See the proof of the 5 example in the following chap.

II. *When one of the terms given is a a whole or a mixt number; also when both of them are mixt numbers, reduce such whole or mixt number or numbers into an improper fraction or fractions by the* 8 *or* 10 *rules of the* 7 *chapter, and then the operation will be the same as in the last rule.*

Reduction of divers Coyns.

Reduction of divers Coyns.

I. *IN questions of Coyns are commonly found* 3 *numbers, two of which the second and third) being reduced to the lowest value, multiply the second number under the first (or which is all one, the first under the second) divide the product by the third, and the quotient answers the question.*

Although

Although moſt of the queſtions commonly reſolved by this rule, may be performed by the rules of Practiſe, or Golden rule, yet I conceive the following method will be more familiar to a learner, who may thereby gain the advantage of underſtanding the different wayes of operation, and (when practiſe hath qualified him with ability) make choiſe of the beſt.

The rules of Practiſe are but compendious operations in the rule of three. And queſtions of Barter, Exchange, &c. are reſolved by that rule; but in favour to the learner, Barter, &c. are digeſted, by ſome, into diſtinct chapters, by others into diſtinct queſtions, becauſe (ſeeming new things) they invite the fancie, and appear leſſe crabbed to the learner.

Cardacues d. s.

In 89609 at $19\frac{1}{2}$, how many li. sterl. at 20

See 6 rule 10 ch.

39 2 *half-pence*—480

806481 39 *half-pence*

268827 li. *which, according to the rule of this chapter will be found* 14 s. $7\frac{1}{2}$ d.

48|0)349475|1(7280 $\frac{351}{480}$

336

134

96

387

384

351

Answer 7280 $\frac{351}{480}$ li.

Rex-doll. s. d. s.

See 2 rule 10 chap.

In 9876 at 5—8, how many lib. at 20?

17 3 3

69132 17 *groats* *groats* 60

9876

60)16789|2(12 *groats remain*

2798 li. 4 s.

Answer 2798 li. 4 s.

In

C. qu. lb. C.
In 88—3—19 how many fother at $19\frac{1}{2}$ Reduction of lead.
2 2

39)177(4 *foth.* $10\frac{1}{2}$C. 39
156

2)21

$10\frac{1}{2}$

In 100 Piggs of lead, each $5\frac{1}{2}$C. how many Fother at $19\frac{1}{2}$C.

Piggs $5\frac{1}{2}$C. 2 — Fother $19\frac{1}{2}$C. 2

39)1100(28 *fother* 4 C. 39
78

320
312

8

Chap. XI.

Of Rules of Practiſe, or compendious operations in the Rule of 3.

I. BEfore any profitable progreſs can be made in the rules of practiſe, the even or aliquot parts of a pound (in ſhillings, pence and farthings:) Alſo the aliquot parts of a ſhilling (in pence and farthings) muſt be perfectly underſtood, according to the following tables.

The aliquot parts of a pound, in shillings, pence and farthings.

s.	d.	f.	parts
0	0	1	1/960
0	0	2	1/480
0	0	3	1/320
0	1	0	1/240
0	1	2	1/160
0	2	0	1/120
0	3	0	1/80
0	4	0	1/60
0	5	0	1/48
0	6	0	1/40
0	8	0	1/30
0	10	0	1/24
1	0	0	1/20
1	3	0	1/16
1	4	0	1/15
1	8	0	1/12
2	0	0	1/10
2	6	0	1/8
3	4	0	1/6
4	0	0	1/5
5	0	0	1/4
6	8	0	1/3
10	0	0	1/2

The aliquot parts of a shilling, in pence and farthings.

d.	f.	parts
0	1	1/48
0	2	1/24
0	3	1/16
1	0	1/12
1	2	1/8
2	0	1/6
3	0	1/4
4	0	1/3
6	0	1/2

II. *When the price is an aliquot part of a pound sterling, divide the summe propounded by a number representing how often such a part is contained in a pound:* viz. *admit* 2 *s.* 6 *d. because* 2 *s.* 6 *d. is* 8 *times in a pound sterling, divide the summ propounded by* 8, *as in the examples following.*

lb.	s. d.		lb.	s. d.
8)7897	at 2–6		6)7897	at 3–4
Answer 987	—2–6	*Answer*	1316	—3–4

See Reduction of divers coyns chap. 7.

	Rex-dol.	s.	d.
4)	987|6	at 5	—8
30)			
	2469		
	329	4	
Answer	2798	—4	

III. *When the price is not an aliquot part of a pound, it must be parted or reduced according to the following method, wherein is denoted the number of aliquot parts to be taken.*

for

Divide by

s.

for 3-10 *&* 20, *or take* $\frac{1}{10}$ *and* $\frac{1}{2}$ *of that quotient.*
for 6--4 *&* 20, *or multiply by* 3, *divide by* 10.
for 7--4 *&* 10,
for 8--5 *&* 5, *or multiply by* 4, *divide by* 10.
for 9--4 *and* 5.
for 11--2 *&* 20.
for 13--55, *&* 4.
for 14--2 *and* 5.
for 15--4 *the quotient trebled gives the price.*
for 16--5 *the quotient quadrupled gives the price, &c.*

C. s.

4)
5) 78978 at 9 *per C.*

19744-10-0
15795-12-0

Answer 35540-02

The quotients added are pounds.

C. s.
4)78970 at 15 *per C.*

19742--10
3

Answer 59227--10--0

or thus.

C. s.
78978 at 9 *per C.*
9

2)71080|2

Answer 35540-2

C. s.
78970 at 15 *per C.*
15

394850
7897

2)118455|0

Answer 59227-10

IIII.

IIII. *When the price is an aliquot part of a ſhilling, take the ſame part of the ſumm propounded,* viz. *admit* 4 *d. becauſe* 3 *times* 4 *make* 12 *I take* $\frac{1}{3}$ *of the ſumm propounded.*

lb. d.
3)78908 at 4 *per lb.*

2)2630|2---8

Anſwer 1315-2--8

*Dividing by 20, is (according to the 18 rule of the 15 chapter) to cut off the laſt figure of the dividend toward the right hand, and half the remainer.

lb. d.
4)709081 at 3 *per lb.*

2)17727|0---3

Anſwer 8863-10-3

V. *When the price is not an aliquot part of a ſhilling, it muſt be parted or reduced,* viz.

Pence	Divide by
For 5	6 and 4
7	4 and 3
8	3 and 3
9	2 and 4
10	2 and 3
11	3 and 3 and 4

viz.

3) lb. d.
3)70787 at 11 *per lb.*
4)
23595 — 8
23595 — 8
17696 — 9
2)6488|8
Answ. 3244–8 s.–1 d.

Add all the quotients together for a new dividend, and divide by 20.

2) lb. d.
4)70834 at $10\frac{1}{2}$ *per lb.*
8)
35417
17708 — 6
8854 — 3
2)61979
Answer 30989–1–9

VI. *When the summ propounded is of one denomination, and the price of severall species or denominations, observe the order of the following operations.*

	Cardas.	d.
2)	89609 at	$19\frac{1}{2}$
8)	44804	6
	11201	$1\frac{1}{2}$
2)	14561|4	
Answer	7280 - 14	$7\frac{1}{2}$

See Reduction of divers coyns chap. 7.

	lb.	s. d.
4)	7890 at	13-$4\frac{1}{2}$
8)	13	
	23670	
	7890	
	1972	6
	986	3
2)	10552|8	
Answer	5276	8--9

	lb.	s. d. f.
4)	789	at 19-3-3
16)	19	
	7101	
	789	
	197	------3
	49	------3-3
2)	1523	7
Answer	761	---17---3-3

VII. *When the summs propounded and the price consist of severall species or denominations.*

	ells	s. d.		yards	s. d.
4)	789½	at 3-4½	3)	789¼	at 3-4
8)	3			3	
	2367			2367	
	197---3			263	
	98---7½		2)	2630	
	1---8¼			131.10s.10d.	

In

In the first qneſtion before, for the ½ ell take ½ of 3 s. 4½ d. And in the ſecond queſtion, for ¼ of a yard take ¼ of 3 s. 4 d.

Alſo the like may be done in the following queſtions of groſs weight, 112 lb. to the C. by taking for ½ hundred, being 56 pound, the half of the ſumm of monie that 112 is worth; then the ½ of that ſumm for ¼ being 28 lb. and the half of that for the half quarter, being 7 lb. &c.

C.	qu.	lb.	li.	s.	d.	
3)	973	--3--21	at	3	--12--4	*per C.*
	72					
	1946					
	68110					
		324--4				
		36--2				
		18--1				
2)	70434					
	3521 li.		14	s.	7 d.	

	C.	qu.	lb.		s.	d.	
2)							
8)	98	3	24½	at	39	7½	per C.
	39						
	882						
	2940						
	49						
	12	3	q.				
	19	9	3				
	9	10	3½				
	4	11	1¾				
	2	5	1½				
	1	2	2½				
2)	392	1					
	196	1	6	2			

VIII. *When the ſumm of monie expended conſiſteth of ſeverall ſpecies or denominations, and the commoditie bought but of one denomination, proceed according to the following example.*

At

li. s. d.
At 3. 7. 4. the C. what 9 C.
9

Answer 30. 6. 0.

9 Times 4 d. is 36 d. set down 0 and carry 3 shillings; 9 times 7 s. is 63 s. and 3 s. in minde is 66 s. set down 6 shillings and carry 3 li. 9 times 3 is 27 and 3 in minde is 30, *Answer* 30 li. 6 s. 0 d.

The learner may easily perceive that it will be much to his advantage (when there is occasion) to part the number to be bought, and to double, treble, or quadruple the products. This observation relates both to the 8 and 9 rules of this chapter.

IX. *When the commodity bought is of one, and the price paid of one or more denominations, to know the value of a pound, or peece of the commodity bought, proceed as followeth.*

When

When 12 peeces coſt 50 li. 2 s. 6 d. what muſt I pay for one peece?

li.	s.	d.
50.	2.	6.
12		
Anſwer 4.	3.	6.

See the 3 rule 6 th.

After the ſame order of working, in 990 C. 3 qu. 21 lb. groſs (tare 14 lb. *per cent.*) will be found 867 C. 0 qu. 8 lb. neat, as in the margent.

C.	qu.	lb.	
8)990.	3.	21	*groſs*
123.	3.	13	*tare*
867.	0.	8	*neat*

X. *When any commodity is bought or ſold after 5 ſcore to the hundred, or quintall, the following order will be ſignificant.*

When

When 100 lb. cost 27 li. 13 s. 4 d. what must I pay for a pound?

Answer 5 s. 6 d. 3 $\frac{3}{5}$ f.

	li.	s.	d.
	27.	13.	4.
	20		
shill.	5	53	
		12	
pence	6	40	
		4	
farth.	1	6	0 3
		10	0 5

After the last manner of operation, questions of simple interest may be resolved, *viz.*

What will 17 li. give in interest after the rate of 6 *per cent. per ann.*

Answer 1 li. 0 s. 4 d. $3\frac{1}{5}$ f.

	li.			
	17			
	6			
pounds 1	02			
	20			
shillings 0	40			
	12			
pence 4	80			
	4			
farthings 3	20	2	1	
	100	10	5	

And 25 li. 14 s. at 8 li. *per cent. per ann.* will give in interest 2 li. 1 s. 1 d. $1\frac{19}{21}$ f.

Also 425 li. 13 s. 9 d. will give 34 li. 1 s. $1\frac{1}{5}$ d.

Many other pleasant and profitable abreviations will be found out by a frequent practise of the former rules.

To discover the interest of any summ, for any number of moneths, under twelve, multiply the princi-

pall

pall by the rate of intereſt, as before; then for two moneths take $\frac{1}{6}$ of the totall: for 3 moneths $\frac{1}{4}$, &c. according to the table, denoting the aliquot parts of 12, in the firſt rule of this chapter. If the moneths in your queſtion be not an aliquot part of 12, then reduce them according to the 5 rule of this chap. The intereſt of any ſum of monie for dayes may be ſpeedily known by the rule of 3.

XI. *Queſtions of compound intereſt may be reſolved like thoſe of ſimple intereſt, cyphers being added to the principall propounded, and regard had to the following order of working, viz.*

What will 30 li. principall give after the rate of 6 li. *per cent. per ann.* being continued for 3 years at intereſt upon intereſt (that is, intereſt for the principall and intereſt for intereſt?)

Anſwer 35 li. 1 s. 5 d. 2 f. as will be manifeſt by the following operation.

li.

30.00—*Omit to multiply the cyphers*
6 *added to the principall, by*
180 *the rate of intereſt.*

318000 *firſt year*
6
19080
33708000 *ſecond year*
6
2022480
pounds 35 | 730480 *third yeare*
20
ſhillings 1 | 461600
12
pence 5 | 539200
4
farthings 2 | 156800

But for calculation of ſuch queſtions, you may compoſe the following breviat thus, *viz.*

106 is the principall & intereſt due at the firſt years end, which multiplyed into 106, gives 11236 for principall and intereſt the ſecond year; which product multiplyed in

to 106, gives 119101 for the third year, &c. When your product exceeds 6 places, cut off the excesse at the right hand in every operation: And after the like order tables may be composed for any rate of compound interest, if you add the rate of interest to 100, and proceed as before.

The Table.

years		years	
1	1.06	12	2.01223
2	1.1236	13	2.13296
3	1.19101	14	2.26093
4	1.26247	15	2.39658
5	1.33821	16	2.54037
6	1.41850	17	2.69279
7	1.50361	18	2.85435
8	1.59382	19	3.02561
9	1.68944	20	3.20714
10	1.79080	21	3.39956
11	1.89824		

Triall of the former queſtion by the breviat.

Againſt 3 years you finde 119101 which multiply by 30 li. the principall and cut off 5 places, you finde 35 li. then multiply the remains by 20, by 12, and by 4, as in the operation, and you ſhall finde principall and intereſt 35 l. 1 s. 5 d. 2 f.

		30
35	73030	
		20
1	460600	
		12
5	527200	
		4
2	108800	

If you omit the unite in the place next to years, and multiply 19101 by the principall, it will give you the intereſt only

		19101
		30
5	73030	
		20
1	460600	
		12
5	527200	
		4
2	108800	

Alſo

Also questions of sale, to gain after any rate *per cent.* may be answered as the second question in this rule.

When I pay 14 li. for a peece of cloth, how must I sell the same to gain after the rate of 6 li. *per cent.*

Answer, the peeces must be sold for 14 li. 16 s. 9 d. 2⅖ f.

	li.
	14
	6
no pounds	48
	20
shill. 16	80
	12
pence 9	60
	4
farth. 2	40 | 2
	100 | 5

When an ell of Holland is bought at 3 s. 9 d. how may the ell be sold to gain after the rate of 20 l. *per cent.*

3 s. 9 d. reduced to pence, gives 45 d. which multiplyed by 20, and 2 places cut off toward the right hand, according to the order in the margent, gives 9 d. which added to the price, makes 4 s.

45
20
9 | 00

6 d. at which rate the ell muſt be ſold to gain after the rate of 20 li. *per cent.*

If you would ſell the ſame to loſe after that rate, ſubtract 9 d. from the price, reſteth 3 ſhillings, which is the price the ells ought to be ſold at, to loſe after the rate of 20 li. *per cent.*

Chap. XII.

The Golden Rule of 3 direct.

I. *The golden Rule is that by which certain numbers being given another proportionall unto them may be found out.*

II. *The golden rule is either ſingle or compound.*

The Rule of three.

III. *The property of the ſingle rule is, three*

three numbers being given, to finde a fourth; from whence it is likewise called the rule of 3.

IIII. *The terms of this rule consist of two denominations, two of the terms propounded have one, & the other term given, with the term required, have another.* So this question being demanded, If 8 yards cost 12 li. what will 32 yards cost? the answer will be 48 l. and here yards and pounds are the two denominations of the terms in the question, whereof 8 and 32, being two of the terms propounped, have the denomination of yards, and 12, the other term given, together with the term required, have the denomination of pounds. The divers denominations of the terms thereof. Question 1.

V. *In the rule of* 3, *the numbers given must be so ranked, that the number or term upon which the question is moved (wherein the force of the question lyeth) must possesse the third place, and that (of the other two) which is of the same* The right ordering of the terms.

ſame denomination, the firſt place. Alſo that of the ſame denomination with the fourth term required (or anſwer to the queſtion) the ſecond place. So in the queſtion before mentioned, the terms 8, 12, and 32 are thus placed, *viz.* 32 is the term upon which the queſtion is moved (wherein the force of the queſtion lyeth) and therefore is ſet in the third place; 8 is of the ſame denomination, and therefore in the firſt: Laſtly, 12 being of the ſame denomination with the term ſought (*viz.* of monie) is in the ſecond place; and ſo they will be placed in the rule thus;

8—12—32

The term upon which the queſtion is moved doth, for the moſt part, follow theſe or ſuch like words, viz. How many? How much? How long? How farr? How deep? What coſt? What will? What ſhall? &c. Another

ther example may be this. If I pay 48 li. for 32 yards of cloth, how much monie will buy 8 yards? This queſtion being thus propounded, the terms will rank themſelves as followeth. Queſtion II.

y.	*li.*	*y.*
32	48	8

VI. *The Rule of 3 is either direct or inverſe.*

VII. *The Rule of 3 direct is when the fourth term (the term required) ought to proceed from the ſecond term, according to the ſame rate and proportion that the third proceeds from the firſt.* So in the firſt example of the 5 rule aforegoing, 32 the third term differs from 8 the firſt by quadruple reaſon. So 48, which is the term required, differs from 12, the ſecond, by the like reaſon; for, as 4 times 8 is 32, ſo 4 times 12 is 48. The Rule of 3 direct

VIII. *In the direct Rule, if you multiply the ſecond term by the third or* (*which* How to work the ſame Rule viz.

1 In whol numbers, the terms being fingle numbers.

(which is all one) the third term by the ſecond, and then divide the product by the firſt, the quotient will give the fourth term or fourth proportionall required. So in the queſtion firſt propounded if you multiply 32 by 12 the product is 384, which if you divide by 8, the quotient will give you 48, the fourth term demanded.

Obſerve the ſignifications of the following characters.

x *Signifies multiplied, or drawn into, or multiplyed by.*

† *Signifies more by, or added to.*

— *Signifies leſſe by, or ſubtracted from*

: : *Denotes the middle of four proportionalls.* So the example aforegoing and the anſwer may be placed thus,

viz. 8. 12 :: 32. 48.

that is, if 8 give 12, then 32 gives 48.

= *Signifieth equall to, or as much as.*

IX. *When the third term contains the firſt any certain number of times which*

(*which often falls out*) *multiply the second term by the number of times that the first is contained in the third, and the product is the fourth term required.* So in the first example, 32, the third number, contains 8, the first, 4 times; therefore multiply 12, the second number, by 4 (the number of times that the first is contained in the third) and the product will be 48, the fourth term required.

X. *If the first contain the third a certain number of times, divide the second by the number of times that the third is contained in the first, and the quotient will be the fourth term sought.* So in the second example 8, the third number, is contained in 32, the first, 4 times; therefore divide 48, the second, by 4, and the quotient gives 12, the fourth term required, both for answer of the question and proof of the first example.

The third example may be this. Question III. If 57 pair of silk-stockings cost 47 li. what's

what's the price of 1 pair at that rate? The terms rank themselves as in the margent, and the answer will be $\frac{47}{57}$ li. for 47 multiplyed by 1 is 47, for the dividend, which being lesse then the divisor 57, the quotient will be found (according to the 19 rule of the 5 chapter) $\frac{47}{57}$, which fraction, by the 7 and 4 rules of the 7 chapter, will be reduced to 15 s. 11 d. $2\frac{6}{19}$ f.

pair	*li.*	*pair*
57	47	1

57. 47 :: 1. $\frac{47}{57}$.

Question IIII.

A fourth example may be this. If $25\frac{1}{2}$ yards cost 48 li. 15 s. 4 d. 3 f. what monie is to be paid for 40 yards $\frac{3}{4}$? the answer will be found 77 li. 18 s. 8 d. $2\frac{61}{102}$ f. And here observe, *When the three known terms (or any of them) are compounded of numbers under divers denominations, such terms (or term) must be reduced into*

2 In whole numbers, the terms being compounded.

into the leaſt of thoſe denominations by the rules of the 6 chapter; viz. Here the firſt and third term are not of one particular denomination, and therefore the firſt is reduced into quarters of yards to agree with the third, and the ſecond into farthings, which, ſo reduced, will ſtand in the rule thus,

qu.	*farth.*	*qu.*
102	46819	163

Laſtly, proceeding according to the 8 rule of this chapter, the anſwer will be 77 li. 18 s. 8 d. $2\frac{62}{102}$ f.

The fifth example may be this. Queſtion V. 3 Infractions. if $\frac{5}{8}$ of a yard of velvet be worth $\frac{2}{3}$ of a pound ſterling, what is the value of $\frac{1}{12}$ of a yard of the ſame velvet, the anſwer will be found $\frac{16}{240}$; *For if you multiply the denominator of the firſt term, and the numerators of the ſecond and third terms continually, the laſt product is a new numerator or dividend: Alſo multiply the numerator of the firſt term* See continuall multiplication, in the 15 rule of the 4 chap.

term into the denominators of the ſecond and third continually, the laſt product is a new denominator or diviſor. So in the ſaid example, the denominator 8, multiplyed into the numerators 2 and 1 continually, the product will bee 16, for a new numerator or dividend: Alſo multiplying the numerator 5, with the denominators 3 and 16 continually, the product is 240, for a new denominator or diviſor; ſo is the anſwer of the queſtion found to be $\frac{16}{240}$, which abreviated is $\frac{1}{15}$, or reduced according, to the 7 rule of the 7 chapter, 1 s. 4 d.

Queſtion VI. The ſixth example may be this. If a quantity of Amber-greeſe, weighing $1\frac{5}{7}$ lb. *Troy*, be worth 60 l. ſterling, what is the value of $19\frac{5}{8}$ gr. The anſwer will be found 2 s. $4\frac{119}{192}$ d. Here you are to obſerve, That in the rule of three in fractions, *When either of the terms is a whole or a mixt number, ſuch whole number or mixt number is to be reduced into an improper*

proper fraction, by the 10 *and* 8 *rules of the* 7 *chap.* Also, *When the first and third terms are not of the same particular denomination, such of the said terms which is of the lesser denomination is to be reduced into the greater denomination by the* 11 *rule of the* 7 *chapter, and then the operation will be as before.* So the terms of this question being first of all reduced into improper fractions, will stand in the rule thus;

$\frac{12}{7}$ lb. $\frac{60}{1}$ li. $\frac{157}{8}$ gr.

And since the third term $\frac{157}{8}$ gr. is not of the same denomination with the first, it must be reduced into such denomination, *viz.* $\frac{157}{8}$ of $\frac{1}{24}$ of $\frac{1}{20}$ of $\frac{1}{12}$ of a pound *Troy*, which compound fraction (by the 11 rule of the 7 chapter) will be reduced into the single fraction $\frac{157}{46080}$ of a pound *Troy*, and so the terms will stand in the rule as followeth:

I $\frac{12}{7}$ lb.

$$\frac{12\text{ lb.}}{7} \qquad \frac{60\text{ li.}}{1} \qquad \frac{157\text{ lb.}}{46080}$$

Then working, as in the 5 example, the anſwer will be found $\frac{65940}{55296}$ which being reduced by the 7 and 3 rules of the 7 chapter, is 2 s. $4\frac{119}{192}$ d.

Or you may reduce $\frac{12}{7}$ lb. the firſt term, to the ſame denomination with the third, by the 7 rule of the 7 chapter, and the queſtion will ſtand thus;

$$\frac{69120\text{ gr.}}{7} \qquad \frac{60}{1} \qquad \frac{157\text{ gr.}}{8}$$

And then proceeding as before, the anſwer will be the ſame.

Proof of the rule direct.

XI. *For the proof of the direct rule of three, multiply the fourth term by the firſt, which done, if that product be equal to the product of the ſecond and third terms, the work is right, otherwiſe it is erroneous.* So in the firſt example 8 being multiplied by 48, the product is

is 384, which is also the product of 12 multiplyed by 32.

In like manner, in the fifth example, $\frac{5}{8}$ (the first term) being multiplied by $\frac{16}{240}$ (the fourth term) the product will be $\frac{80}{1920}$, which reduced by the second, or by the third and second rules of the 7 chapter, is $\frac{1}{24}$ which is equall unto the product of $\frac{2}{3}$ and $\frac{1}{16}$ the second and third terms, as appears by the work.

If you prove the work this way, see multiplication of Fractions, chap. 10.

The 5 example may likewise be proved by an inversion of the question, *viz.* $\frac{5}{8}$ gives $\frac{2}{3}$, then $\frac{1}{16}$ gives $\frac{16}{240}$; therefore invert the question, and $\frac{1}{16}$. $\frac{16}{240}$ to $\frac{5}{8}$. $\frac{1280}{1920}$, which abreviated or reduced by the second rule of the 7 chapter, the answer will be $\frac{2}{3}$ for proof of the first operation. In like manner doth the second example prove the first, as is also evident by the operation.

Chap. XIII.

The Inverse Rule of three.

I. *THe Rule of three inverse is when the 4 term (the term required) proceeds from the second term, according to the same proportion as the first proceeds from the third.*

Any number between 2 is a mean, the other 2 are extreams.

Observe alwaies by the tenor of the question, whether more or less be required: When lesse is required, the greater of the two extream numbers is the divisor, when more is required, the lesser extream is the divisor.

How to work the Rule of 3 inverse.

II. *In the inverse Rule of 3, if you multiply the first term by the second, or (which is all one) the second by the first, and then divide the product by the third, the quotient will give the fourth term required.*

The

The firſt example may be this. When 8 Pioners digg a trench in 12 dayes, in how many dayes will 16 perform the like ſervice. Queſtion I.

men dayes men
8—12—16–will doe it in 6 dayes

Here leſſe being required, 16, the greater extream, is diviſor; and the Anſwer, or fourth proportional, is 6, which may be found twice in 12 the ſecond number, as 8 the firſt may in 16 the third number.

The ſecond example may be this, the firſt being inverted. If 16 men perform a peece of work in 6 dayes, in how many dayes will 8 men perform the like? Queſtion II.

men dayes men
16—6—8–will doe it in 12 daies

Here more being required, 8 the leſſer extream is the diviſor, and the

Answer will be 12, which contains 6 the second number twice, as 16 the first contains 8 the third. And hereby you may be able to discover when a question belongeth to the Rule direct or Rule inverse; for the divisor in the Inverse Rule is the third term, in the Direct Rule the first.

To discern whether a Question in the rule of 3 belong to the Rule direct or Rule inverse.

Question III. A third example may be this, *viz.* If the half-penny white-loaf weigh 6 ounces when wheat's at 12 s. the quarter, what must it weigh when wheat is sold at 18 s. *per* quarter.

Answer 4 *ounces:* For how much the greater the price of the wheat, so much the lesse the weight of the bread.

Question IIII. The fourth example may be this, How much monie must I lend for 12 moneths to requite the loan of 730 li. for 6 moneths.

Answer 365 l. For, another lending me a greater summ for a lesse time, I must lend him a lesse summ for

for a greater time.

The fifth example may be this. If a yard in bredth have $25\frac{2}{5}$ ells in length, what length must $\frac{3}{4}$ broad have. *Answer* $33\frac{13}{15}$ *ells* : For the lesser the bredth, the greater the length; *viz.* the terms rank themselves thus; Rule of 3 inverse in Fractions.

bredth	*length*	*bredth*
$\frac{4}{1}$	$\frac{127}{5}$	$\frac{3}{1}$

Then if you *multiply the numerators of the first and second terms and denominator of the third continually, the product is a new numerator or dividend. Again if you multiply the numerator of the first into the denominators of the second and third continually, the product will be a new numerator or divisor, and the answer will bee as formerly.*

III. *In the inverse rule of three, the product of the third term multiplyed by the fourth must accord with the product*

of the first and second terms, otherwise the work is erroneous. So in the first example of the last rule the product of 16 multiplyed by 6 is 96, which likewise is the product of 12 multiplyed by 8; or invert the question to prove the work, as in the second example in this chapter.

Chap. XIIII.

The double Golden Rule.

I. *THe Compound Golden Rule, is when more then 3 terms are propounded.*

II. *Under the Compound Golden rule is comprehended the double Golden Rule, and divers Rules of plurall Proportion.*

III. *There are four kinds of Compound Rules; and in each a different form of operation; therefore without a diligent*

gent reſpect to the Rule whereunto your queſtion is properly ſubject, you will frequently fall into groſſe errors.

IIII. *Thoſe four kinds are thus diſtinguiſhed.*

The Golden Rule direct and the Golden Rule Inverſe; and for diſtinction ſake the other two are term'd, the Golden Rule Aſcending, and the Golden Rule Hylls 176 *Deſcending.*

V. *The two firſt may properly be called primitives, the two latter derivatives, becauſe they are (after a ſort) derived from the other, yet not of like terms or compounded after one form.*

VI. *The double golden Rule is when 5 terms being propounded, a ſixth proportionall unto them is demanded,* as in this queſtion: If 100 li. in 12 moneths gain 10 li. what ſhall 40 li. gain in 6 moneths?

VII. *The terms given in this Rule conſiſt of two parts,* viz. *a ſuppoſition, expreſſed in the 3 firſt terms; and a demand propounded in the two laſt.*

So

So in the first example of the last rule this clause (If 100 l. in 12 moneths gain 10) is the supposition, and this clause (what shall 40 l. gain in 6 moneths) is the demand.

VIII. Here for ranking the terms propounded in their due order, observe first, *That the principall cause of action or passion, losse or gain, cost or charge, supplies the first place; the space of time, distance of place, &c. the second; the work finished, the price of the weight carried, the interest or gain, &c. the third, as* 100 *li.* 12 *mo.* 10 *li. and the two terms wherein the demand lyeth must agree with two of the three suppositious terms, and be placed under them,* viz. 40 *li. being of like nature and denomination with* 100, *the first term; and* 6 *being of like nature and denomination with the second, are placed under them accordingly*: Then the terms will stand as followeth.

40 li. cannot be said to be of the same nature and denomination with 10 li. because that bears the denomination of interest, and the two terms 100 l. and 40 li. of principall.

100

li.	*mo.*	*li.*
100	12	10
40	6	

Here is to be obſerved, That when the term ſought (the blank) falls under the third term, the queſtion is anſwered by the Rule Direct, And *the three laſt terms being multiplyed continually for dividend, and the two firſt for diviſor, the quotient will bee the 6 proportionall or term ſought, viz.* 2, which anſwers the third term and ought to be placed under it; and then the *6* terms ſtand thus, *viz.* How to know the Rule direct from the Rule inverſe.

li.	*mo.*	*li.*
100	12	10
40	06	02

Whereby it is manifeſt, that if 100 li. in 12 moneths give 10 li. 40 li. in *6* moneths will give 2 li.

When the term ſought (the (blank How to know the Rule in-

verſe from the Rule direct.

blank) falls under the firſt or ſecond term, the queſtion muſt be reſolved by the Rule Inverſe, *viz.*

If 100 li. ſtock in 12 moneths raiſe 10 li. intereſt, in how many moneths will 40 li. ſtock raiſe 2 li. intereſt?

100——12——10
40—— ——2

Here the blank falling under the ſecond term, ſhews the queſtion is to be reſolved by the Rule Inverſe, And *the firſt ſecond and laſt terms being multiplied continually for dividend, and the third and fourth for diviſor*, the Anſwer will be 6 moneths, which agrees with the ſecond term; and ſo the 6 terms ſtand thus;

li.	*mo.*	*li.*
100	12	10
40	6	2

If

If 24 Rods of ditching be wrought by 4 men in 12 dayes, how many Rods may be wrought by 16 men in 48 dayes? The Rule direct.

Answer 384.

men	*dayes*	*rods*
4	12	24
16	48	

If 24 Rods require 4 men to finish it in 12 dayes, how many men will 384 rods require to work it in 48 dayes? The Rule inverse; the blank falls under the first term.

Answer 16 *men.*

men	*dayes*	*rods*
4	12	24
	48	384

If $33\frac{1}{3}$ li. stock in $\frac{3}{4}$ of a year raise $2\frac{1}{2}$ li. interest, what shall 400 li. stock bring in for interest in $\frac{1}{4}$ yeare? The compound Rule direct in Fractions.

li.	*year*	*li.*
$33\frac{1}{3}$	$\frac{3}{4}$	$2\frac{1}{2}$
$\frac{400}{1}$	$\frac{1}{4}$	

The

The mixt numbers being reduced according to the 8 Rule of the 7 chapter, multiply the two first denominators continually into the last three numerators, for numerator or dividend; and the two first numerators into the three last denominators, for denominator or divisor; And the answer will be found 10 li.

The compound Rule inverse in Fractions.

If 400 li. principall in $\frac{1}{4}$ year raise 10 li. interest, in what time will 33 $\frac{1}{3}$ li. principall give 2 $\frac{1}{2}$ li.

The terms ranked and reduced as before, *Multiply the numerators of the first, second and fift numbers continually into the denominators of the third and fourth, for numerator or dividend; and the denominators of the first second and fifth into the numerators of the third and fourth, for denominator or Divisor;* and the answer which proves the last example) will be $\frac{3}{4}$ year.

If 2 Angells countervail 20 s. and 12 s. countervail 2 crowns, how many angells will countervail 10 crowns? The compound Rule descending, in whole numbers.

angells	*s.*	*s.*	*crowns*	*crowns*
2	20	12	2	10

Although the number of the terms in this queſtion be equivalent to thoſe in the former, yet this queſtion ſtands not upon two interrogatorie terms, as the other did; for here *the four firſt terms contain a ſuppoſition and the queſtion lyeth in the fifth, which is the* 10 *crowns*; for the demand is, How many angells will countervail 10 crowns? *Multiply the firſt third and fift terms continually for dividend, and the ſecond and fourth for diviſor*; and the Anſwer will be found 6 angells.

If 2 angells countervail 20 s. and 12 s. countervail 2 crowns, how many The compound Rule aſcending

In whole numbers.

many crowns will countervail 6 angells?

angells	*s.*	*s.*	*crowns*	*angells*
2	20	12	2	6

Multiply the second fourth and fifth continually for dividend, and the first and third for divisor; and the answer will be found 10 crowns, for proof of the last example.

The compound Rule descending, in Fractions.

If $\frac{3}{4}$ of a double-Ducat countervail $\frac{2}{3}$ of a Rose-noble, and $\frac{4}{5}$ of a Rose-noble countervail 2 french Crowns, how many double-Ducats are equivalent to 20 french Crowns?

double-duc.	*rose nob.*	*rose-nob*	*fr.crown*	*fr.crowns*
$\frac{4}{4}$	$\frac{2}{3}$	$\frac{4}{5}$	$\frac{2}{1}$	$\frac{20}{1}$

Multiply the numerators of the first third and fift continually into the denominators of the second and fourth terms, for dividend; and the denominators

nators of the first third and fift, into the numerators of the second and fourth terms for divisor; and the answer will be found 9 double-ducats.

The compound Rule ascending in Fractions.

If $\frac{3}{4}$ of a double-Ducat be equivalent to $\frac{2}{3}$ of a rose-Noble, and $\frac{4}{5}$ of a rose-noble equall to 2 french Crowns, how many french Crowns are equivalent to 9 double-Ducats?

doub.duc.	*rose-nob.*	*rose-nob.*	*fr crown*	*doub.duc.*
$\frac{3}{4}$	$\frac{2}{3}$	$\frac{4}{5}$	$\frac{2}{1}$	$\frac{9}{1}$

Multiply continually the numerators of the second fourth and fifth terms into the denominators of the first and third for dividend; *and the denominators of the second, fourth and fifth terms into the numerators of the first and third for divisor*; and the answer will be found 20 french crowns.

Chap. XV.

Of Plurall Proportion.

I. IN *answering a question depending upon this Rule, the use of the golden Rule is required more then once,* as will be evident by the following examples, and,

2 Particular Rules of plurall proportion, are the Rules of Fellowship and Alligation

II. *Of these Rules there are divers kindes and varieties, according to the nature of the question propounded.*

If a yard delivered for 2 s. 10 d. to be paid at 3 moneths gain 25 li. *per cent.* in 12 moneths, what cost the yard ready monie?

moneths	*li.*	*mon.*	*li.*
12.	25 ::	3.	$6\frac{1}{4}$ li.
$106\frac{1}{4}$ *li.*	100 ::	34 *d.*	32 *d.*

for Answer.

Here both the proportions are direct.

For proof you may invert the queſtion thus: If one yard at 2 s. 8 d. ready monie, be ſold for 2 s. 10 d. to be paid at 3 moneths, what is gained upon 100 li. in 12 moneths?

Thus 1 { 32 *d.* 2 *d.* :: 24000 *d.* 6 $\frac{1}{4}$ *li.*
3 *mo.* 6 $\frac{1}{4}$ *l.* :: 12 *mo.* 25 *l.*

Or thus 2 {

	d.	*mo.*	*d.*
If	32	3	2
	24000	12	*Anſwer proût ſupra.*

If 12 pence wine ſatisfie 8 men at a meal when wine is at 6 d. *per* quart, how many men will 20 d. in wine ſatisfie when wine is at 4 d. *per* quart?

d.	*men*		*d.*	*men*	
12.	8	::	20.	13 $\frac{1}{3}$	Here the firſt part is direct the latter inverſe.
6.	13 $\frac{1}{3}$	::	4.	20	

If the half-penny loaf weigh 8 $\frac{4}{3}$ $\frac{3}{3}$. when wheat is worth 20 s. *per* quarter, what ought a two penny

loaf to weigh when wheat is worth 12 s. *per* quarter?

Here the first part is inverse, the latter direct.

20 s. $8\frac{4}{5}\frac{3}{3}$. :: 12 s. $13\frac{3}{5}\frac{3}{3}$.
$\frac{1}{2}$ d. $13\frac{3}{5}\frac{3}{3}$. :: 2 d. $54\frac{2}{5}\frac{3}{3}$.

Answer $54\frac{2}{5}\frac{3}{3}$. for the weight of a two penny loaf, when wheat is at 12 s. *per* quarter.

In the first of these three examples, the Rules are both direct; in the second, the first direct, the latter inverse; and in the third, the first inverse, the latter direct: from whence you may observe, that unlesse you carry a diligent eye upon the Rule that concerns the question, you fall into confusion.

Chap. XVI.

Of Fellowship without time.

I. THe *Rule of fellowship is that by which in accompts amongst divers men, their severall stocks*

ſtocks together, with the whol gain or loſſe being propounded; the gain or loſſe of each particular perſon may be diſcovered.

Three Merchants adventure,

li.

A. 100 } they gain 140 li.
B. 135 } what are their ſe-
C. 280 } verall advantages?

Totall ſtock 515

II. In this Rule which is called the ſingle Rule of Fellowſhip, *The totall ſtock is the firſt number in the Golden rule: The loſſe or gain, the ſecond: The different ſtocks, the third; and conſequently each mans particular advantage or loſſe, the fourth term required:* For, Fellowſhip without time.

li.	*li.*	*li.*	*li.*	*s.*	*d.*	*f.*	
515.	140 ::	100.	27.	3.	8.	1 $\frac{45}{515}$	45
515.	140 ::	135.	36.	13.	11.	3 $\frac{35}{515}$	35
515.	140 ::	280.	76.	2.	3.	3 $\frac{435}{515}$	435
	proof	140.	00.	0.	0		515 = 1. *f.*

III. For proof, *add the respective gains of each person together, and if the totall of their respective gains equall the totall summ gained by their adventures, the work is perfect, as in the aforegoing example, otherwise not. If there be losse add their losses.*

Two Merchants enter Partnership, and make a stock of 500 li.

A. 300 } They lose 210 li. what are
B. 200 } their respective losses?

500. 210 :: 300. 126
500. 210 :: 200, 084

Or when you have found A to lose 126 li. subtract that from 210 rests 84 li. for B, then

126 + 84 = 210 li. for proof.

Fellowship with time.

In this Rule which is called the double Rule of Fellowship, *The aggregate of the particular stocks multiplied by the time (they are continued out)*

is

is the first number in the Golden Rule; the losse or gain the second; The particular stocks multiplyed by their time, the third; each mans losse or gain will be the fourth, the term required.

4 Merchants put mony to stock

A. 100 *for* 4
B. 297 *for* 5
C. 380 *for* 6
D. 1000 *for* 9
} *moneths* { *They gain* 780, *what are their respective advantages?*

	li.	*mo.*	
A.	100	x 4	= 0400
B.	297	x 5	= 1485
C.	380	x 6	= 2280
D.	1000	x 9	= 9000
			13165

Then

	li.	*s.*	*d.*	*f.*	
13165.789 ::	400.	23.	19.	5.	1 $\frac{9855}{13165}$ A.
13165.789 ::	1485.	88.	19.	11.	2.7130 B.
13165.789 ::	2280.	136.	12.	10.	2.4830 C.
13165.789 ::	9000.	539.	7.	8.	1.4515 D.
					789.00.00.0 *for proof.*

3 Butcher's Rent a Pasture at 30 li. *per ann.* in which they feed 98 Oxen.

A. 20 *for* 70
B. 46 *for* 56 } *dayes* : { *What proportion of Rent must each pay?*
C. 32 *for* 60

A. 20 x 70 = 1400
B. 46 x 56 = 2576
C. 32 x 60 = 1920

5896

Then

			li.	s.	d.	f.
5896.	30 ::	1400.	7.	2.	5.	2 $\frac{3152}{5896}$
5896.	30 ::	2576.	13.	2.	1.	2. 5328
5896.	30 ::	1920.	9.	15.	4.	2. 3312
			30.	00.	0.	0. *for proof.*

CHAP.

Chap. XVII.

Of Rebate.

I. *Rebate or discompt of monie is when a summ of monie due at any time to come, is satisfied by the payment of so much present monie, which being put forth at a certain rate of interest for the said time, would become equall to the summ first due.* So if 100 l. due at the end of a year, be to be satisfied by the payment of present monie upon rebate, after the rate of *6 li. per cent. per annum*, simple interest, there ought to be so much present monie paid, as would in a year, after the said rate, be augmented unto 100 *li.*

II. *When a question of Rebate is answerable by one operation, the agregate of the principall and rate of interest is the first number in the Golden Rule, a*

100

100 *the ſecond, and the ſumm to be paid at a certain time prefixed (for which Rebatement to be made upon preſent or other payment, within the time firſt prefixed) is the third.*

III. *When queſtions of Rebate are anſwerable by two or more operations, a year or* 12 *moneths is the firſt number, in the firſt operation, in the Golden Rule; The rate of intereſt, the ſecond; and the number of moneths or years (at expiration whereof the payment of monie upon rebatement is to be made) the third; then the numbers in the ſecond operation, &c. will be the ſame with thoſe in queſtions anſwerable at one operation, according to the ſecond Rule as will be evident by the following examples.*

How much ready monie will pay 100 li. due at the end of a year, rebating after the rate of *6 per cent. per ann.* ſimple intereſt?

Anſwer $94\frac{18}{53}$ *li.*

li. li. li. li.
106.100 :: 100.$94\frac{18}{53}$ { *which at years end will become* 100 *li.*

How

How much monie to be paid at 11 moneths, rebating at 11 *per cent. per ann.* ſimple intereſt, will be equivalent to 700 l. due at 12 moneths?

Anſwer 635 *li.* 17 s. $7\frac{869}{1331}$ d.

mo.	*li.*	*mo.*	*li.*
12.	11	:: 11.	$10\frac{1}{12}$

li.	*li.*	*li.*	*li.*	*s.*	
$110\frac{1}{12}$.	100	:: 700.	635.	17.	$7\frac{869}{1331}$ *d.*

How much preſent monie is equivalent to 400 li. payable, *viz.*

li.

200 *at* 8 *moneths* } *rebating at* 8 *l.* per
140 *at* 6 *moneths,* } cent. per annum
60 *at* 2 *moneths,* } *ſimple intereſt?*

Anſwer 183 *li.* 13 s. 11 $\frac{3}{4}$ *d.* $\frac{1163}{17143}$ q.

mo.	*li.*	*mo.*
12.	8.	:: 8. $5\frac{1}{3}$
12.	8.	:: 6. 4
12.	8.	:: 2. $1\frac{1}{3}$

Then

li.	*li.*	*li.*	*li.*	*s.*	*d.*	
$105\frac{1}{3}$.	100	:: 200.	189.	17.	$5\frac{1}{2}$	*&c.*
104 .	100	:: 140.	134.	12.	$3\frac{1}{2}$	*&c.*
$101\frac{1}{3}$.	100	:: 60.	59.	4.	$2\frac{1}{2}$	*&c.*
			183.	13.	11 $\frac{3}{4}$. $\frac{1163}{17143}$	

A Merchant ſells comodities to the value of 1260 li. payable at 9 moneths; but deſiring his money preſent, rebates at 8 li. *per cent. per ann.* ſimple intereſt: Now what's the ſum to be paid, and the ſum to be rebated?

Anſwer 1188 $\frac{36}{53}$ *to be paid, and* 71 *l.* 6 *s.* 4 $\frac{52}{53}$ *d. to be rebated.*

mo.	*li.*		*mo.*	*li.*
12.	8	::	9.	6

Then

106. 100 :: 1260. 1188 $\frac{36}{53}$

Queſtions of this nature I have ſeen anſwered thus, *viz.*

mo.	*li.*		*mo.*	*li.*
12.	8	::	9.	6

100. 6 :: 1260. 75 *li.* 12 *s.*

Or

li.	*mo.*	*li.*
100.	12.	8.
1260.	9.	75. 12 *s.*

Which ſhews 1184 li. 4 s. to be paid,

aid, and 75 li. 12 s. to be rebated both which wayes of operation, though frequently practised, are alike erronious; for there will be (by relying upon either of them) 4 li. 5 s. 7 $\frac{1}{13}$ d. losse.

Diligent regard therefore ought to be had to the Rules, Precepts and Principles of Art, which (errors or mistakes in computation or printing may be tollerated) ought alwaies to be true certain and infallible.

Mr. *Mellys*, in the ground of Arts *fol.* 483, hath this question; A Merchant hath bought Holland cloth at 8 s. 6 d. *per* ell, which proveth not to his expectation; whereupon he is content to lose 2 li. 3 $\frac{11}{23}$ s. in 20 pounds laying out: the question is, What price ought to be made of the cloth, abating this losse.

And then he gives his Rule for resolution of the question thus; Add 2 li. 3 $\frac{11}{23}$ s. to the 20 li. and say, by the Rule of 3, If 22 li. 3 $\frac{11}{23}$ s. give

but

but 20 li. what ſhall come of 8
6 d. work and you ſhall finde 7 s. 8
the juſt price that the ell ought to b
ſold for, after the rate of this loſſe
wherein he is at a loſſe; for th
queſtion ought to be reſolved thus,

li.	*li.*	*s.*		*li.*	*s.*
20	— 2.	$3\frac{11}{25}$	=	17.	$16\frac{11}{25}$

Then

li.	*li.*	*s.*		*s.*	*d.*	*s.*	*d.*	*f.*
20.	17.	$16\frac{11}{25}$	::	8.	6.	7.	6.	$3\frac{1}{4}$

So the anſwer is found 7 s. 6 d. $3\frac{1}{4}$

Mr. *Baker* in *The Well-ſpring of Sciences, fol.* 126, committeth the like error, *viz.* he hath this queſtion and anſwer:

If a yard of cloth of Tiſſue be ſold for 3 li. 15 s. whereupon is loſt after the rate of 10 d. in the 100 li. I demand what $12\frac{1}{2}$ yards of the ſame Tiſſue did coſt? *Anſwer*, Add unto 3 li. 15 s. his own $\frac{1}{10}$ part, which

which is 7 s. 6 d. and all amounteth to 4 li. 2 s. 6 d. then look what the 12 ½ yards will amount unto, after 4 li. 2 s. 6 d. and your ſhall finde that they will come to 51 li. 11 s. 3 d. ſo much did the 12 ½ coſt;

Which is erroneous; for, working as before, you will finde every yard of Tiſſue to coſt 4 li. 3 s. 4 d. and not 4 li. 2 s. 6 d. and that the 12 ½ yards coſt 52 li. 1 s. 8 d. and not 51 li. 11 s. 3 d.

Mr. *Johnſon* in his Arithmetique *fol.* 170 hath this queſtion and anſwer.

A Merchant received for principall and gain 328 li. wherein he found he had gained cleer 56 li. what did he gain upon the 100 li. *Anſwer*, Multiply 100 by 56, the gains make 5600 wch divide by 328, & the quotient is 17 $\frac{3}{41}$ li. which is a groſs error; For, if 272 li. 56 li. :: 328 li. 20 $\frac{10}{17}$ l. and not 17 $\frac{3}{41}$ li. according to his anſwer, which cannot poſſibly be true his Rule being falſe.

Chap. XVIII.

The Rule of Alligation.

I. *He Rule of Alligation is that by which we resolve questions that concern the mixing of divers simples together.*

II. *Alligation hath 2 species, Alternate and Mediall.*

III. *Alligation alternate is, when having the severall rates of divers simples given, we discover such quantities of them as are necessary to make a mixture, which may bear a certain rate propounded.*

IIII. *Alligation alternate hath these three varieties.*

1. If the price of every of the simples be expressed, but no quantity, and it be demanded how the simples may be mixed that

that one measure or quantity may be sold at a mean rate? then meer Alligation alternate answereth such questions.

2. If the measure or quantity of one of the simples, and the prises of every of the simples are expressed, and the demand be, what quantity, or how much of every of the other simples may be commixed with the simple expressed to sell at a mean rate? then Alligation alternate and the Golden Rule perform such questions.

3. If the price of every simple, but none of their quantities be expressed, and it be demanded, how much must be taken to make up a certain quantity to be sold at a mean rate? Alligation alternate, Addition of the excesses, and the Golden Rule perform such questions.

V. *All the quantities and measure*
must be alike and of the same kinde.

VI. *The price of the mixed quantity*
is a mean price betwixt some of the prises
of the simple quantities.

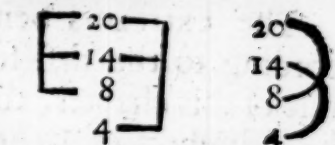
VII. *Alligation alternate doth alter*
or change the location of the excesses o
differences falling out between the mean
price of both the extreams, ascribing tha
to the greater extream which proceed
from the lesser, & contra; *and this be*
ing done, the said excesses so alternall
and interchangably scituated, doe forth
with declare the due proportion of ever
simple entring the mixture: In alliga
ting the extreams of the prises, observ
these 3 Rules.

1. *That each greater extream must be linked with the lesse, the thing whereof the Rule taketh his name,* viz.

20
14
8
4

2. *When both the greater and lesse*
extreams are not single, that the
they may be linked so diversly, an

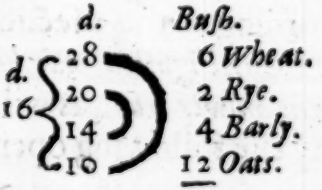
so often that sundry excesses & differences may be applyed for one, and there will be diversity of answers, and yet all true; as,



3. *If either of the extreams be single and the other extreams be plurall, the single extreams must be linked with all the rest, and then there can be but one answer.*

Examples of the first variety.

Wheat at 28 d. Rye at 20 d. Barly at 14 d. and Oats at 10 d. *per* Bushell, are so to be mixed, as a Bushell of the mixture may be sold for 16 d. Question 1.



The extreams being linked according to the first section of the 7 rule of this chapter, the answer will be 6 bushels of Wheat, 2 of Rye, 4 of Barley, and 12 of Oats, to sell a bushel of that mixture at 16 d. the the bushel.

For proof of this and such like questions, you are to understand, That *the product of the summ of the quantities found* x *the mean price propounded will be* = *the summ of the severall products of each quantity* x *its rate or price*, viz.

$$24 \times 16 = 384.$$

And

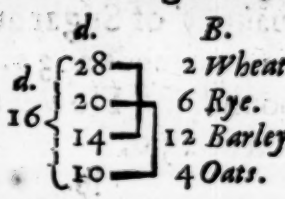
$$28 \times 6 = 168. \quad 20 \times 2 = 40. \quad 14 \times 4 = 56. \quad 10 \times 12 = 120$$

And

$$168 + 40 + 56 + 120 = 384$$

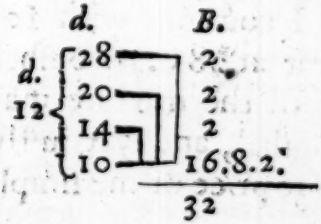
According to the 2 section of the 7 rule, *the Alligation may be altered, and yet the answer true*, as will be manifest by the following operation.

16 d.



And ſo by this Alligation there muſt be taken 2 of Wheat, 6 of Rye, 12 of Barley, and 4 of Oats to ſell a buſhell at 16 d.

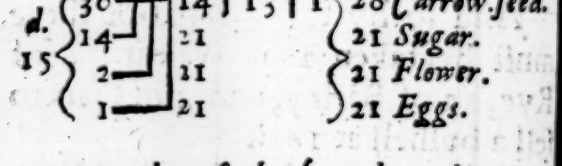
If the mean price given had been 12 d. then the Alligation would be as full, and the anſwer thus,



You muſt take 2 B. of Wheat, 2 of Rye, 2 of Barley, and 26 of Oats to ſell a B. of that mixture at 12 d.

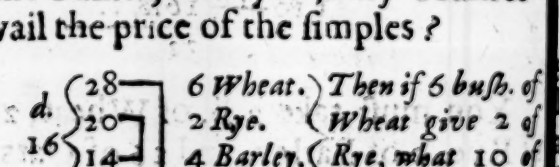
Proof 32 x 12 = 384. *and*
28 x 2 = 56. 20 x 2 = 40. 14 x 2 = 28. 10 x 26 = 260
and 56 † 40 † 28 † 260 = 384, *as before.*

Question II. What quantity of Sugar at 14 d. *per* lb. Carroway-seeds at 3 s. Eggs at 1 d. the pound, and Flower at 2 d. make a pound at 15 d.



Examples of the second variety.

Question I. How many bushels of Rye at 20 d. Barley at 14 d. and Oats at 10 d. must I commix with 10 bush. ls of Wheat at 28 d. *per* bushel, that the price of the mixture may be 16 d. the bushel, and yet justly countervail the price of the simples?



6. 2 :: 10. $3\frac{1}{3}$
6. 4 :: 10. $6\frac{2}{3}$
6. 12 :: 10. 20

Wherefore

Wherefore I conclude, that for every 10 bushels of Wheat I must take $3\frac{1}{3}$ of Rye, $6\frac{2}{3}$ Barley, and 20 of Oats at the same prises, to afford the mixture at 16 d. the bushel. For,

And for proof I say,

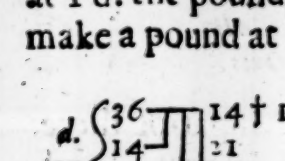
10 bushels of Wheat at 28	=	280 d.
$3\frac{1}{3}$ Rye ——— at 20	=	$066\frac{2}{3}$
$6\frac{2}{3}$ bushel of Barley at 14	=	$093\frac{1}{3}$
20 bushels of Oats at 10	=	200
40		640
And 40 bushels at 16 d.	=	640

The same work will hold in all the severall observations of linking the values, as in the first varieties, and yet all true.

How many quarts of Sherry at 9 d. and Maligo at 6 d. *per* quart must I mix with a 100 quarts of Canary at 12 d. *per* quart, to make the measure sell at 10 d. *per* quart? Question II.

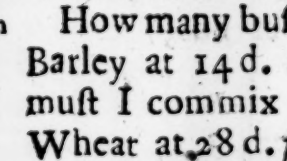
$$10\left\{\begin{matrix}12\\9\\6\end{matrix}\right\}\begin{matrix}4\\2\\2\end{matrix}\dagger 1 \quad \left\{\begin{matrix}5.\ 2 :: 100.\ 40\\5.\ 2 :: 100.\ 40\end{matrix}\right.$$

Question II. What quantity of Sugar at 14 d. *per* lb. Carroway-seeds at 3 s. Eggs at 1 d. the pound, and Flower at 2 d. make a pound at 15 d.



Examples of the second variety.

Question I. How many bushels of Rye at 20 d. Barley at 14 d. and Oats at 10 d. must I commix with 10 bush. ls of Wheat at 28 d. *per* bushel, that the price of the mixture may be 16 d. the bushel, and yet justly countervail the price of the simples?



6. 2 :: 10. $3\frac{1}{3}$
6. 4 :: 10. $6\frac{2}{3}$
6. 12 :: 10. 20

Wherefore

Wherefore I conclude, that for every 10 bushels of Wheat I must take $3\frac{1}{3}$ of Rye, $6\frac{2}{3}$ Barley, and 20 of Oats at the same prises, to afford the mixture at 16 d. the bushel. For,

And for proof I say,	10 bushels of Wheat	at 28	= 280 d.
	$3\frac{1}{3}$ Rye	at 20	= $066\frac{2}{3}$
	$6\frac{2}{3}$ bushel of Barley	at 14	= $093\frac{1}{3}$
	20 bushels of Oats	at 10	= 200
	40		640
	And 40 bushels	at 16 d.	= 640

The same work will hold in all the severall observations of linking the values, as in the first varieties, and yet all true.

How many quarts of Sherry at 9 d. and Maligo at 6 d. *per* quart must I mix with a 100 quarts of Canary at 12 d. *per* quart, to make the measure sell at 10 d. *per* quart? Question II.

$$10 \left\{ \begin{matrix} 12 \\ 9 \\ 6 \end{matrix} \right] \begin{matrix} 4 \\ 2 \\ 2 \end{matrix} \dagger 1 \left\{ \begin{matrix} 5.\ 2 :: 100.\ 40 \\ 5.\ 2 :: 100.\ 40 \end{matrix} \right.$$

Therefore I conclude, that for every 100 quarts of Canary I must take 40 of Sherry and 40 of Maligo, to sell it at 10 d. the quart in the mixture.

		d.	s.
And or proof I say	100 quarts of Canary at	12	=100
	40 quarts of Sherry at	9	=030
	40 quarts of Maligo at	6	=020
	180		150
	180 quarts at ———	10	=150

Examples of the third varietie.

Question I. I would mix 100 bushels of Wheat, Rye, Barley and Oats, so as I might afford a bushel of the mixture at 10 d. *per* Bushel, how much of each sort must I take? The prises of the grain are, *viz.* Wheat 20 d. Rye 16 d. Barley 8 d. and Oats 6 d. *per* bushel. The operation is as followeth.

d.

10	20	4 *Wheat.*
	16	2 *Rye.*
	8	6 *Barley.*
	6	10 *Oats.*
		22

Then,

22. 100 :: 4. $18\frac{2}{11}$ *Wheat.*
22. 100 :: 2. $9\frac{1}{11}$ *Rye.*
22. 100 :: 6. $27\frac{3}{11}$ *Barley.*
22. 100 :: 10. $45\frac{5}{11}$ *Oats.*

Queſtion II.

Gold of 20, 22, 24 carracts fine is ſo to be mixed with alloy, that 100 ounces of the mixture may be but 18 carracts fine.

18	20	18	18
	22	18	18
	24	18	18
	0	2 † 4 † 6	12
			66

Alloy bearing no fineneſſe, for is pure

66. 100 :: 18. $27\frac{3}{11}$
66. 100 :: 18. $27\frac{3}{11}$
66. 100 :: 18. $27\frac{3}{11}$
66. 100 :: 12. $18\frac{2}{11}$

Therefore

Therefore mix 27 $\frac{3}{11}$ of every sort of gold with 18 $\frac{2}{11}$ alloy, and it will be 18 carracts fine.

Question III. How much alloy must be mixed with Bullion of 9 $\frac{1}{2}$ ounces fine, to abase the Bullion to 6 ounces fine?

$$6\left\{\begin{matrix}9\frac{1}{2}\\0\end{matrix}\right)\begin{matrix}6\\3\frac{1}{2}\end{matrix}\Big\}$$

For every 6 $\frac{3}{3}$. of silver I must take 3 $\frac{1}{2}\frac{3}{3}$. of alloy.

Question IIII. Compound silver of 3. 5. 8. and 10 ounces fine, to be 6 ounces fine.

$$6\left\{\begin{matrix}3\\5\\8\\10\end{matrix}\right.\begin{matrix}4\\2\\1\\3\end{matrix}$$

Therfore I conclude I must take 4 $\frac{3}{3}$. of three fine, and 2 of 5, and 1 of 8, and 3 of 10, to make it 6 $\frac{3}{3}$. fine.

Question V. Compound 500 lb. weight of Silver out of Bullion of 3. 5. 8 and 10 ounces fine, that it may be just 6 ounces fine.

$$6\left\{\begin{matrix}3\\5\\8\\10\end{matrix}\right.\begin{matrix}4\\2\\1\\3\end{matrix}$$

10. 500 :: 4. 200
10. 500 :: 2. 100
10. 500 :: 1. 050
10. 500 :: 3. 150

200

200 ℥. *of* 3 ℥. *fine*
100 ℥. *of* 5 ℥ *fine*
050 ℥. *of* 8 ℥ *fine*
150 ℥. *of* 10 ℥ *fine*
} *muſt make up the* 500 *lb. weight at* 6 ℥. *fine.*

A Vintner having divers ſorts of wines, *viz.* wine at 3 s. 3 d. wine at 3 s. 6 d. wine at 2 s. and wine at 1 s. 6 d. how may a mixture containing 100 gallons be made to ſell a gallon at 2 s. 3 d. Queſtion VII.

	s. d.	s. d.
s. d. 2.3.	5. 3.	0. 9.
	3. 6.	0. 3.
	2. 0.	1. 3.
	1. 6.	3. 0.
		5. 3.

d. d.	d. d.	s. d.
63. 100 ::	9.14 $\frac{6}{21}$	*of the Wine at* 5.3. *per gal.*
63. 100 ::	3.04 $\frac{16}{21}$	*of the wine at* 3.6. *per gal.*
63. 100 ::	15.23 $\frac{17}{21}$	*of the wine at* 2.0. *per gal.*
63. 100 ::	36.57 $\frac{3}{21}$	*of the Wine at* 1.6. *per gal.*
	100	

If the Vintner deſire to take more of

of one sort of wine then another, he may link the prizes as in the sections of the 7 rule of this chapter.

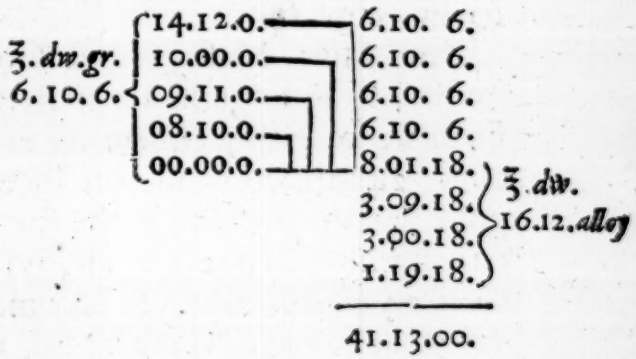
Question VII. A Goldsmith hath divers sorts of Silver, *viz.* some of 14 ounces 12 dw. fine, othersome of 10 ounces, another sort of 9 ounces 11 dw. and and some of 8 ounces 10 dw. he desires to produce a masse of Silver weighing 30 ounces, 6 dw. 6 gr. fine; how much ought he to take?

The work.

14. 12. 00.	10. 00. 00.
—06. 10. 06.	—06. 10. 06.
08. 01. 18.	03. 09. 18.
09. 11. 00.	08. 10. 00.
—06. 10. 06.	—06. 10. 06.
03. 00. 18.	01. 19. 18.

I am now to link them together, but I per-

perceive that the given rate being leſſe then any fineneſſe propounded, I muſt mix ſome alloy to ſatisfie the demand.



Then if 19992 gr. 14544 gr. :: 3126 gr. 2774 $\frac{114}{333}$ gr. that is, If 41 ℥. 13 dw. 0 gr. give 30 ℥. 6 dw. 10 gr. what will 6 ℥. 10 dw. 6 gr. give? and the anſwer is 4 ℥. 14 dw. 18 $\frac{114}{333}$ gr.

Then if 19992 gr. 14544 gr. :: 7968 gr. 5797 $\frac{371}{2499}$ gr. that is, If 41 ℥. 13 dw. 0 gr. give 30 ℥. 6 dw. 10 gr. what will 16 ℥. 12 dw. 0 gr. give? And the anſwer is 12 ℥. 1 dw. 13 gr. Therefore the Gold-Smith ought

ought to take of every of the ſorts of ſilver 4 ℥. 14 dw. 18 $\frac{114}{133}$ gr. and of alloy 12 ℥. 1 dw. 13 gr. to make up a maſſe of 30 ℥. 6 dw. at 6 ℥. 10 dw. 6 gr. fine.

The Mint Maſters and Gold-ſmiths, to diſtinguiſh the differing fineneſſe of gold, eſteem an intire ounce 24 carrects, and an ounce of gold that being tried in the fire loſeth nothing of the weight, is ſaid to be 24 carrects fine. In like manner that which loſeth $\frac{2}{24}$ of the ounce, is eſteemed to be 22 carrects fine; and ſo conſequently of the reſt.

Alloy is Silver, Copper, or ſome other baſer metal, with which the Gold-ſmiths uſe to mix their Gold, to the intent they may moderate or abate the fineneſſe thereof.

As the fineneſſe of Gold is meaſur'd by carrects, ſo is the fineneſſe of Silver eſtimated by ounce.

A pound of Silver which upon tryal loſeth nothing of the weight,

is

is ſaid to be 12 ounces fine. But a pound that upon tryall loſeth ſomwhat of the weight, is ſaid to be the remainder of the weight fine. Example; A pound of Silver that loſeth in the fire one ounce 8 dw. is eſtimated to be 10 ounces 12 dw. fine; and that which loſeth 2 ounces 8 dw. 10 gr. is ſaid to be 9 ounces 11 dw. 14 gr. fine, &c.

Alligation Mediall.

I. *Alligation Mediall, is, when having the ſeverall quantities and rates of divers ſimples propounded, we diſcover the mean rate of a mixture compounded of thoſe ſimples.* So 10 buſhels of wheat at 4 s. 40 buſhels of Rye at 3 s. 50 buſhels of Barley at 2 s. *per* buſhel being mixed with 20 buſhels of Oats at 12 d. the buſhel, the rule of Alligation mediall ſheweth you the mean price of that miſtling, which will be manifeſt by the following operation. 10

B.	d.	d.
10.	48.	480
40.	36.	1440
50.	24.	1200
20.	12.	240
120.		120)3360
		28 d.

II. *Each particular price* x *its own quantitie propounded, and the agregate of the ſeverall products divided by the agregate of the quantities, gives for anſwer to the queſtion* 28 *d.* Which is ſo obvious, that it needs not further explanation:

Or, ſumm the given quantities, then finde the totall of the ſimples, which done, the proportion will be, *viz.* As the ſumm of the quantities is to the totall value of the ſimples, ſo is any part of the mixture propounded to the required mean rate or price of that part, *viz.*

B.	d.	B.	d.
120.	3360 ::	1.	28.

A Mer-

A Merchant having ſeverall ſorts of cloth, is deſired to fix a price, how he will ſell one ell with another: Now what price ought he to ſet upon the following parcells, that he may neither loſe nor gain above the priſes?

	s.	s.
30 *ells at* 5	*per ell*	150
35 *ells at* 7½	*per ell*	262½
40 *ells at* 9	*per ell*	360
60 *ells at* 12½	*per ell*	750
		ell
then 165 *ells give*	1522½	:: 1. 18 11/33 *teſter*

A Goldſmith having 8 lb. of ſilver bullion of 7 ounces fine 15 lb. of 8½ ounces fine, and 13 lb. of 10 ounces fine, would melt altogether and know what fineneſſe a lb. weight of the Maſſe ſhall be.

Deſcribe the given quantities with their ſeverall prizes or values of their fineneſſe as followeth:

$8 + 15 + 13 = 36$

$7.\ 8\frac{1}{2}.\ 10$

$56 + 127\frac{1}{2} + 130 = 313\frac{1}{2}$ *then*

$36.\ 313\frac{1}{2} :: 1.\ 8\frac{51}{72}$ *Wherefore I conclude a pound of the Masse to be* $8\frac{51}{72}$ *ounces fine, whose tryall may be made thus,*

lb. ℥.

The value of $\left\{\begin{array}{l} 8 \text{ of } 7 \text{ fine is } 56 \\ 15 \text{ of } 8\frac{1}{2} \text{ is } 127\frac{1}{2} \\ 13 \text{ of } 10 \text{ is } 130 \end{array}\right\}$ $313\frac{1}{2}$ ℥. *the totall, and the value of*

36 *lb.* $8\frac{51}{72}$ *ounces fine is* $= 313\frac{1}{2}$

A Goldsmith hath melted 12 lb. 5 ounces of Gold Bullion of 18 carrects fine, with 4 lb. $4\frac{1}{2}$ ounces of 21 carrects fine: Now of how many carrects fine is a pound of the Masse?

Reduce the quantities to $\frac{1}{2}$ *ounce, the lowest denomination in the question.*

$298 + 105 = 403$

$18 \quad 21$

$298 \times 18 = 7569.\ 105 \times 21 = 2205$

then $403.\ 7569 :: 1.\ 18\frac{315}{403}$ *whereby a lb.*

a lb. of the Masse is discovered to be $18\frac{31}{40}$ *carrects fine.*

A Mint-Master hath 100 pound weight of Gold of 22 carrects fine, and 20 pound weight of 19 carrects fine; whether ought any alloy to be mixed with it or not, and if any, how much, to make a pound of the mixture 20 carrects fine?

First discover what fineneſſe a pound weight of this maſſe will bear, when both ſorts are mixed together.

100 + 20 = 120
22. 19.
100 x 22 = 2200. 20 x 19 = 380
2200 + 380 = 2580. *then,*
120. 2580 :: 1. $21\frac{1}{2}$ *carracts fine;*

Therefore 'tis evident alloy muſt be mixed to abate it from $21\frac{1}{2}$ to 20, which is found by Alligation alternate.

$$20 \left\{ \begin{array}{l|l} 21\frac{1}{2} & 20 \\ 0 & 1\frac{1}{2} \end{array} \right\}$$

Now the exceſſes declare, that for every 20 pound weight of Gold he muſt take $1\frac{1}{2}$ of alloy, then

20. $1\frac{1}{2}$ :: 120. 9.

which ſhews that he muſt mix 9 lb. alloy with 120 lb. of Gold, to make a pound of the Maſſe 20 carrects fine.

A Goldſmith hath divers ſorts of Bullion, *viz.* 24 lb. of 7 ounces fine, 30 lb. of 9 ounces fine, and 16 lb. of 12 ounces fine, and he would ſo melt them together, that a pound of the mixture might bear 10 ounces fine, whether ought any alloy to be melted therewith, and how much?

24 † 30 † 16 = 70.
7. 9. 12
24 x 7 = 168. 9 x 30 = 270. 16 x 12 = 192
168 † 270 † 192 = 630. *then,*
70. 630 :: 1. 9. *but the Gold-ſmith ſhould have* 10 *ounces fine:*

Wherefore this mixture is not fine enough by an ounce in every pound

pound: So that no alloy is to be mixed, but more fine silver must be put in, as appears by the following fabrique, wrought by Alligation alternate,

$$10 \left\{ \begin{matrix} 9 \\ 12 \end{matrix} \middle| \begin{matrix} 2 \\ 1 \end{matrix} \right\}$$

Signifying, that for every 2 lb. of the 3 Bullions mixed together, there must be taken a pound of fine silver. Lastly, I conclude 2. 1 :: 70. 35 lb. of fine silver to be incorporated, to make a pound 10 ounces fine.

lb.	℥.		*proof*		
24	x 7	= 168	70 *lb. at* 9 ℥. *fine*		= 630
30	x 9	= 270	35 *at* 12 ℥. *fine*		= 420
16	x 12	= 192	105		
35	x 12	= 420			
105		1050	*and as* 630 + 420		= 1050
			so 105	x 10	= 1050

Choyce and usefull Questions.

1. A Steward received for Rent 6 severall bags of monie, containing, *viz.*

———	1	12 li.
he left one of his bags	2	14
behinde him, and so	3	16
brought home but	4	17
95 li. which of the	5	30
baggs did he leave behinde.	6	20

Answer, the bagg of 14 *li.*

2. There are 4 brasse peeces, they spend at a shot, *viz.*

1	9 *lb. of powder.*
2	5
3	4
4	2

These peeces being appointed against the battery of a hold, with 700 pounds of powder; how many pounds must be allowed to each peece

peece for its true proportion; and how many ſhot will every peece make about?

Anſwer, they may be diſcharged 35 times, and their allowance of powder muſt be, for the

1—315
2—175
3—140
4—070

700

3. When 120 Herrings are bought at 2 a penny, and 120 at 3 a penny, and put together and ſold five 2 d. what is gain'd or loſt?

Anſwer 4 d. loſt.

4. When monie is let out at Bottom-ree at 25 li. *per cent.* what will 37 li. 10 s. amount to? Bottom ree, Sea hazard, or *Cambio Maritimo*

Anſwer 9 li. 7 s. 6 d.

5. How much Pluſh is neceſſary to line a cloak which hath in it 4 yards of $1\frac{1}{4}$ broad, when the Pluſh is but $\frac{3}{4}$ and $\frac{2}{3}$ broad?

Anſwer 8.

6. If 14 ells cost 17 s. what must I give for an ell?

Answer 1 s. 2 $\frac{1}{7}$ d. $\frac{2}{7}$ f.

7. How many peeces of Hangings of 1 $\frac{1}{2}$ yards broad will hang a Room which requires 100 peeces of a yard broad?

Answer 66 $\frac{2}{3}$.

8. If a peece of Scarlet cost 189 l. 19 s. and a yard is sold for 3 li. 15 s. 8 d. how many yards were in the peece?

Answer 50 $\frac{47}{313}$ yards.

9. If 17 s. 8 d. buy a yard and $\frac{1}{4}$ of cloth, how many yards for 1000. marks?

Answer 943 $\frac{1}{4}$ $\frac{31}{53}$ *yard.*

943 $\frac{21}{53}$

10. If 80 $\frac{1}{20}$ C. cost 582 li. 5 s. 8 d. what is the price of a pound?

Answer 1 s. 3 $\frac{1}{5}$ d.

11. If 3 pound of Sugar cost 19 $\frac{1}{2}$ s. what monie will buy 18 $\frac{3}{4}$ C.

Answer 56 *li.* 17 *s.* 6 *d.*

12. If 100 lb. of Cloves cost 15 l. 16 s. 8 d. and 112 lb. of Mace 14 li.

17 s. 10 d. what coſt one pound with another?

Anſwer 2 *s.* 10 *d.* $3\frac{7}{11}$ *f.*

13. What's the value of a pound of Indico when a tunn coſt 1000 li.

Anſwer 8 *s.* 11 $\frac{1}{7}$ *d.*

14. If I buy $2\frac{1}{2}$ lb. of ſugar for 3 s. $8\frac{1}{2}$ d. how many cheſts of $17\frac{1}{2}$ C. ſhall I buy for 40 peeces of Cambrick, each $19\frac{1}{2}$ ells at 7 s. 2 d. *per* yard?

Anſwer $2\frac{359}{980}$ *cheſts.*

15. If $20\frac{1}{2}$ lb. of Tobacco coſt 5 li. 11 s. 8 d. how many french crowns will buy a hh. weight 5 C. 3 qu. 18 lb. groſſe, tare 41 lb.

Anſwer $563\frac{7}{9}$ *french crowns.*

16. What is the price of a pint of oyl when a tunn coſt 35 li. 12 s. 9 d.

Anſwer $4\frac{463}{675}$

17. A Merchant bought 4 butts of Currans, and paid for fraight 3 lb. 11 s. *per* tunn, and for cuſtome 7 s. 2 d. *per* C. what coſt the 4 butts (fraight and cuſtome deducted) at

41 s.

41 s. 8 d. *per* C. neat, tare 16 *per* C.

Answer 156 *li.* 9 *s.*

18. How many dozen of Stockings at 11 groats *per* pair for 200 peeces of Cotten at 31 s. 8 d. *per* peece?

Answer 143 *dozen* 11 $\frac{3}{11}$ *pair.*

19. When 300 Clothes, at 8 *s.* 9 *d. per* peece, are shipt for *Spain*, for returns in wine, at 25 li. 12 s. *per* tunn, how much wine must be returned?

Answer 99 $\frac{3}{115}$ *tunns.*

20. If 19 $\frac{1}{2}$ d. buy an ounce, how many C. weight for 100 peeces of Cambrick at 51 s. 8 d. *per* peece?

Answer 2 $\frac{47}{364}$ C.

21. What may be spent *per diem* out of an estate of 3050 li. *per ann.* there being a reservation of, *viz.*

300 for taxes,
005 for pious uses, and
200 for purchase?

Answer 6 li. 19 s. 5 $\frac{11}{11}$ d.

22. What's a wedge of Gold worth

worth that weighs 4 ounces 6 dw. 15 gr. at 37 li. 17 s. 10 d. *per* lb. 13 li. 13 s. $6\frac{21\,06}{77\,60}$ d.

23. A Merchant hath owing him 986 li. and in part of payment received 1811 dollors at 4 s. 4 d. *per* doller, and 911 piſtolers at 11 s. 10 d. *per* peece, what remains unpaid of the debt?

Anſwer 54 li. 2 s. 2 d.

24. A Butcher bought an Oxe weighing, beſides skin and leggs, 898 lb. the Oxe coſt 12 l. he ſold the skin and legs for 22 s. 4 d. and $16\frac{1}{4}$ ſtone of tallow at $5\frac{1}{2}$ d. *per* lb. what doth a ſtone of beef ſtand him in, and how muſt he ſell a ſtone to gain 40 s. in the whole Oxe?

Anſwer: A ſtone of beef ſtands him in $19\frac{3}{4}$ *d.* $\frac{1}{21}$ *f. and he muſt ſell the ſtone at* 2 *s.* $\frac{73}{96}$ *d.*

A Mer-

25. A Merchant sold 10 Bales of Silk weighing,

bales	C.	qu.	lb.
1	2	3	11
2	2	1	17
3	2	1	16
4	2	3	11
5	2	3	16
6	2	1	26
7	2	0	20
8	2	3	11
9	1	3	22
10	3	0	17
	25	3	17

He allows for tare 7 lb. *per* bale, and selleth the great lb. (243.) at 24 s. 2 d. and in part of payment received 4500 dollers at 4 s. 4 d. *per* doller, and 1847 $\frac{1}{2}$ ells of Holland at 3 s. 1 d. *per* ell, and is to receive the rest in french crowns at 6 s. *per* peece, how many french crowns must he receive?

Answer 7243 $\frac{73}{144}$ *frenceh crowns.*

A Ship

26. A Ship is to be victualed for 60 men for a year (52 weeks or 365 dayes) and each man is to be allowed $\frac{1}{4}$ of a gallon of beer *per diem* and 7 biskets. There are every week 2 Beef dayes, 2 Pork dayes, 3 Fiſh dayes; 7 lb. of Beef is allowed amongſt 4 men every Beef day, 7 lb. of Pork every Pork day and 2 quarts of Peaſe; $\frac{1}{7}$ of a Ling, 2 ounces of Butter and $\frac{1}{4}$ lb. of Cheeſe every Fiſh day.

Now what Proviſions muſt be laid in of each ſort, and what will the Proviſions amount to at the following rates?

Beer 40 *s. per tunn.*
Beef 22 *d. per ſtone.*
Biskets 23.8 *d. per C.* 112 *lb. to the C.*
Fiſh 21 *d. per couple.*
Butter 12 *s. per Firkin, the Firkin* 56 *lb.*
Cheeſe 22 *s per C. bought at* 112 *lb. to the C.*
Pork 16 *d. per ſtone.*
Peaſe 2 *s.* 6 *d. per buſhell.* *Anſ.*

	lb.	s.	d.	
Beer 65 tunn 45 gall.	130	07	1	&c.
Biskets 1368 C.	182	08	0	
Beef 1365 stone	125	02	6	
Pork 1365 stone	091	00	0	
Peaſe 97 ½ buſhels	012	13	9	
Ling 936 couple	081	18	0	
Butter 20 Firk. 50 lb.	012	10	8	
Cheeſe 20 C. 3 qu. 16 lb.	022	19	7	&c.
	658	19	7	&c.

Anſwer

This Ship carries 28 peeces of Ordinance, viz.

3 *Demiculverin of* 16 *lb. bullet*
4 *whole Culverings* 12
6 *Demiculverin* —— 10
8 *Sakers* —————— 7
3 *Faulcons* ————— 4
2 *Faulconets* ———— 1 ½
2 *Mynion-Cuts* ——— 1 ½

How many pound of powder will diſcharge theſe peeces 50 times over, when to ſhoot a bullet of a pound weight there is allowed ½ lb. of powder, and what doth the powder

der amount to at 4 li. 7 s. 6 d. *per* C.

Anſwer 5762 $\frac{1}{2}$ *lb. powder to diſcharge the peeces* 50 *times over, and the powder at* 4 *li.* 7 *s.* 6 *d. per C. amounts to* 225 *li.* 1 *s.* 11 $\frac{42}{113}$ *d.*

27. A Grocer will beſtow 183 li. *viz.* in Cloves at 4 s. 2 d. Mace at 7 s. 6 d. Cynamon at 3 s. 8 d. Nutmegs at 12 s. 3 d. and Pepper at 2 s. 10 d. *per* pound, and will have of one ſort as many pounds as of another; the queſtion is, how many pounds he muſt have of each ſort?

Anſwer 120 $\frac{24}{53}$ lb.

28. How much monie in a year will be proportionable to 250 li. for 5 moneths?

Anſwer 104 $\frac{2}{7}$ li.

29. At 16 li. the 100 ſubtle, what ſhall 895 lb. ſubtle be worth, in giving 4 lb. upon every 100 for trett?

Anſwer 137 *li.* 13 *s.* 10 $\frac{2}{13}$ *d.*

30. At 3 s. 4 d. the pound weight, what ſhall 754 ℔ coſt, allowing 4 lb. weight

weight upon every 100 for trett?

Answer 120 *li.* 18 *s.* $3\frac{3}{13}$ *d.*

31. If 100 lb. be worth 36 s. 8 d. what shall 860 lb. be worth in rebating four pounds upon every hundred for tare and cloffe?

Answer 15 *li.* 2 *s.* $8\frac{4}{13}$ *d.*

32. Whether doth he that giveth upon the 100 or he that rebateth 4 li. upon the 100 lose most?

Answer, He that rebateth 4 *li. in the* 100 *loseth more by* $\frac{15}{13}$ *li. in the* 100 *then he that giveth* 4 *li. upon the* 100.

33. When Pepper is at 2 s. 5 d. *per* lb. and Sugar at 1 s. 2 d. how many pounds of Sugar must be given for 298 pounds of Pepper?

Answer $617\frac{2}{7}$ *lb. Sugar.*

34. If 60 li. discharge 40 laborers for 3 moneths 9 daies labor (accounting 30 dayes to the moneth) how long must 8 laborers work for the same wages?

Answer 16 *moneths* 15 *dayes.*

35. How many ells of ell bredth will

will line 20 yards of $\frac{3}{4}$ broad?

Answer 9 ells $\frac{3}{4}$ of a yard of ell broad will lyne 20 yards of $\frac{3}{4}$ broad.

36. A Debtor dyes indebted to 8 Creditors, *viz* to

A. 100	E. 54
B. 86	F. 32
C. 75	G 24
D. 60	H. 15

The value of his Estate at his death amounted only to 150 li. how must the same be equally distributed amongst the respective Creditors?

Answer: Their severall shares will be,

	li.	s.	d.		li.	s.	d.
A.	33.	12.	7: 2 $\frac{444}{446}$ f.	E.	18.	03.	02. 2 $\frac{436}{446}$ f
B.	28.	18.	5. 2 $\frac{104}{446}$	F.	10.	15	02. 3 $\frac{374}{446}$
C.	25.	04.	5. 3 $\frac{110}{446}$	G.	08.	01	05 0 $\frac{392}{446}$
D.	20.	03.	7. 0 $\frac{88}{446}$	H.	05.	00.	10. 3 $\frac{22}{446}$

37. A, B, C, and D, Partners for two years make their stock thus. A put in 30 li. and at 8 moneths end received back 10 li. and in the be-

ginning of the 20 moneth he put in 12 li. more.

B put in 24 li. and at 6 moneths end took back 8 li. and in the beginning of the 16 moneth he put in 14 li.

C. put in 20 li. and received back the whole ſumm at 7 moneths end, but at the beginning of the 18 moneth put in 14 li.

D put in nothing till the beginning of the 7 moneth, but then he put in 18 l. ; 9 li. wherof he received back at 4 moneths end, and at the beginning of the 17 moneth he reſtored 15 li. Now at the two years end they had gained 100, how much thereof ought each Partner to have?

	li.	s.	d.	
Answer A.	35.	09.	04.	2. $\frac{600}{1745}$ f.
Answer B.	31.	18.	05.	1. $\frac{540}{1745}$ f.
Answer C.	14.	08.	03.	3. $\frac{1428}{1745}$ f.
Answer D.	18.	03.	10.	0. $\frac{928}{1745}$ f.
	100.	00.	00.	0 *for proof.*

38 When

Queſtions of Barter.

38. When Sugar at 12 d. *per* lb. ready monie is barter'd at 14 d. and Ginger at 10 d. bartered at 12 d. how much Sugar will pay for 756 pounds of Ginger?

Anſwer 648 *Sugar.*

39. When Rayſons at 1 li. 14 s. *per* C. ready monie, are bartered at 40 s. how muſt Nutmegs at 4 s. *per* pound be ſold to make the like profit?

Anſwer 4 $\frac{4}{5}$ *ſhill.*

40. How much Brazill at 18 s. the hundred muſt be given for 2000 pounds of Sugar at 18 d. *per* pound?

Anſwer 129 $\frac{17}{25}$ C.

41. 90 Clothes are bartered for 9118 yards of Cloth at 18 d. *per* yard; what price doth each of the 90 Clothes beare?

Anſwer 7 *li.* 11 *s.* 11 $\frac{54}{90}$ *d.*

42. 20 C. of Brazill is given for 43 C. of Coppras at 8 s. *per* C. what price muſt each C. of Brazill bear?

Anſwer 17 $\frac{1}{5}$ *ſhill.*

43. When cynamon at 4 s. ready monie, is barter'd at 5 s. and Cotton at 14 d. *per* yard, is barter'd for the Cynamon; what must the yard be sold for in barter to lose 10 li. *per cent.*

Answer 15 $\frac{3}{4}$ *d.*

44. Chamblets at 3 li. *per* peece ready monie are barter'd at 3 l. 15 s. for Fustians at 35 li. *per* bale ready monie; now what price must the bale of Fustians bear in barter to gain 10 li. *per cent.*

Answer 48 *li.* 2 *s.* 6 *d.*

45. Tapistry at 3 s *per* ell ready monie, barter'd at 3 s. 6 d. for wooll at 3 li. 15 s. *per* C. which cost but 3 li. *per* C. which surmounts the other, and how much *per cent.*

Answer: He with the wooll surmounts the other 7 *li.* 2 $\frac{6}{7}$ *s. per cent.*

46. When 1806 ells of Lockram at 16 d. *per* ell and 30 li. in ready monie are given for Fustians at 18 s. *per* peece, how many peeces of Fustian

ſtian muſt be delivered to equall the barter?

Anſwer 167 $\frac{1}{3}$ *peece.*

47. A hath 100 peeces of ſilk at 3 li. *per* peece ready monie, & barters them with B at 4 li. per peece, taking wooll at 7 li. 10 s. *per* C. which is worth but 6 li. ready monie; now what quantity of wooll payes for the ſilk, and which ſurmounts the other A or B, and how much?

Anſwer; *B loſeth* 20 *li. by the barter.*

48. If a yard at 18 d. ready monie be ſold for 20 d. for 4 moneths, how much is gained *per cent. per an.* Queſtions of loſs and gain with time.

Anſwer 33 *li.* 6 *s.* 8 *d.*

49. How much is loſt *per cent. per an.* when a yard at 4 s. 6 d. ready monie, is ſold for 4 s. to be paid at 8 moneths?

Anſwer 16 *li.* 13 *s.* 4 *d.*

50. If a yard of Cloth coſt 20 s. ready monie, for how long time muſt it be ſold at 19 s. to loſe 15 l. *per cent.*

Anſwer 4 *moneths.*

51. If cloth bought at 8 s. *per* yard for 4 moneths, be sold for 7 s. 6 d. *per* yard ready monie, what is lost *per cent. per an.*

Answer 18 *li.* 15 *s.*

52. If a pound of Pepper at 2 s. 4 d. ready monie be sold for 2 s. 5 d. how long time must be given to gain 14 *per cent. per an.*

Answer $3\frac{3}{49}$ *moneth.*

53. If 24 yards of Velvet cost 9 li. how must the yard be sold for 8 moneths to gain 6 li. *per cent. per an.*

Answer 7 *s.* $9\frac{7}{12}$ *d.*

54. If a peece of holland containing 14 ells be sold for 5 s. *per* ell, payable at 7 moneths, gain 6 li. *per cent. per ann.* how much did the whole peece cost the seller ready monie?

Answer 3 *li.* 7 *s.* $7\frac{41}{69}$ *d.*

55. If I gain 10 li. *per cent. per an.* when I sell a yard of Cloth for 14 s. to be paid at 6 moneths, how must a yard be sold, to be paid at 9 moneths, to gain 20 li. *per cent. per an.*

an. and what was the value of the yard ready monie, when I gained 6 li. *per cent. per an.* by ſelling it at 14 s. *per* yard?

Anſwer 15 *s.* 4 *d. the yard muſt be ſold at, to gain after* 20 per cent. per an. *and the value of the yard ready monie (when* 6 *li.* per cent. per an. *was gained by ſelling it at* 14 *s.* per *yard) was* 13 $\frac{1}{3}$ *ſhilling.*

56. One buyeth 20 yards of Satten for 12 li. 10 s. ready monie; for how much more then it coſt may he ſell the yard, giving two moneths day for payment, to gain after 10 li. in the 100 for 12 moneths?

Anſwer 12 *s.* 8 $\frac{1}{2}$ *d.*

57. A Merchant cómits 200 li. to the diſcretion of his factor, to be employ'd in traffique, conditionally, that he ſhall receive $\frac{1}{2}$ of the gains: What's the eſtimation of the Factors perſon? Queſtions of Factorage.

Anſwer 200 *li.*

58. A Merchant delivers 900 li.

to be employ'd in the trade of Merchandize, conditionally, That the Factor shall have $\frac{1}{3}$ of the gains, and bear, of the losse; what is the Factors person esteemed at?

Answer 450.

59. A Merchant delivers to his Factor 400 li. to be employed in Merchandize, conditionally, That the Factor putting in 80 li. shall have $\frac{1}{4}$ of the gains; what is the estimation of the Factors person?

Answer 320 *li.*

60. A Merchant delivereth his Factor 600 li. and permits him to employ therewith 250 li. of his own, and agreeth that the Factor shall have $\frac{2}{5}$ of the gains: what's the estimation of his person?

Answer 150 *li.*

61. A Merchant delivereth 800 l. to his Factor, to be employed, conditionally, That for the Adventure of his person he shall have the gains which shall arise by 160 thereof: what

what portion of the gains is due to the Factor?

Anſ. $\frac{1}{5}$ *of the gains.*

62. A Merchant at *Syvil* delivered 1500 Ryalls to receive for every 11, being a Ducat, 5 s. 10 d. ſterling at *London*; how much muſt he receive?

Queſtions of exchange of coyns, weights, and meaſures.

Anſwer 39 *li.* 15 *s.* 5 *d.*

63. A Merchant at *London* receives a bill of exchange from *Antwerp* of 150 li. ſterling, for 178 li. Flemiſh delivered there; how went the exchange from *Antwerp* to *London*?

Of Coyns

Anſwer 23 *s.* 8 $\frac{4}{5}$ *d.*

64. If the exchange from *Antwerp* to *London* go at 23 s. 2 d. Flemiſh for one pound ſterl. how much Flemiſh monie is to be delivered at *Antwerp* upon a bill of exchange from *London* of 143 li. 17 s. 8 d. ſterling?

Anſwer 166 *li.* 13 *s.* 3 $\frac{17}{30}$ *d.*

65. If 166 l. 13 s. 3 $\frac{17}{30}$ d. Flem. be received at *Antwerp* upon a bill of exchange from *London* of 143 li. 17 s. 8 d. ſterl. how went the exchange

change from *Antwerp* to *London*?

Anſwer 23 *s.* 2 *d.*

66. A Merch. at *London* delivered 500 ſterl. by exchange from *Hamborough*, at 8 marks 15 s. lubbiſh the pound ſterl. how much ſhall he receive at *Hamborough*, when 16 s. is one mark and 12 d. one ſhilling lubbiſh?

Anſwer 4468 *marks* 12 *s. lubbiſh.*

67. If 4468 marks 12 s. lubbiſh (a mark being 16 s. and 12 d. one ſhilling lubbiſh) be received at *Hamborough* upon a bill of exchange of 500 ſterl. how went the exchange from *Hamborough* to *London*?

Anſwer 8 *marks* 15 *s. lubbiſh.*

68. A Merchant of *Venice* receives a bill of exchange from *London*, of 2458 Ducats 16 s. 8 d. for the value delivered there at 5 s. 5 $\frac{3}{4}$ d. ſterling (the Ducat of *Venice*) the queſtion is how much ſterling monie was delivered at *London* upon the bill of exchange of 2458 Ducats 16 s. 8 d. (20 s. being a Ducat, and 12 d. a ſhil-

a ſhilling *Venetian.*)

Anſwer 673 *li.* 12. 4 $\frac{1}{4}$ *d.*

69. A Merchant delivered in *London* 100 li. ſterling in exchange to receive for the ſame, in *Bayon* in *Spain*, 1 Ducat of 374 Merveides for every 5 s. 10 d. of the ſaid 100 l. how many Merveides payes the bills of exchange.

Anſ. 128128 $\frac{4}{7}$ *merveids.*

70. If 24 Carlins of *Palerma* be worth one crown *de Mark*, and one crown *Demark* 5 s. 10 d. ſterling; how much monie ſterling is equivalent to a Carlin of *Palerma*?

Anſwer 2 $\frac{11}{12}$ *d. ſterling.*

71. If 5 s. 10 d. ſterling be worth one crown *de Mark*, and one crown *de Mark* worth 350 Merveides; how many Mervides are equivalent to 100 li. ſterling?

Anſwer 120000 *Merveides.*

72. If 11 Ryalls be equivalent to one Ducat, & one Ducat to 5 s. 10 d. ſterl. how much ſterl. monie will pay a bill

a bill of exchange of 5000 Ryals?

Anſwer 132 *li.* 11 *s.* 6 $\frac{2}{11}$ *d.*

73. A Merchant delivered in *London* 100 ſterling, to receive in *Paris* a french crown or 50 ſoulx turnois for every 5 s. 3 d. of the ſaid 100 li. how much monie turnois ſatisfieth the bills of exchange?

Anſwer 19047 $\frac{13}{21}$ *french turnois.*

74. A Merchant takes up monie at *Antwerp* after 19 s. 6 d. the pound Flemiſh, to pay for the ſame at *London* 20 s. ſterling. When the day of payment comes, his Factor at *London*, for want of ready monie, takes up as much monie of ſom other Merchant there, to diſcharge the Bills, which he returns to pay again at *Antwerp*, by other Bills of exchange, at 19 s. 9 d. Flemiſh for every pound ſterling by him ſo taken up: what gain or loſſe accrues by the exchange, and how much *per cent.*

Anſwer 1 *li.* 5 *s.* 3 $\frac{8\frac{1}{2}}{37}$ *d.*

75. A Merchant at *London* taketh up

up monie there at 20 s. ſterling, to pay for the ſame at *Antwerp* 21 s. 8 d. Flemiſh. When the day of payment comes, his Factor, wanting ready monie, taketh up monie again at *Antwerp* to ſatisfie the bills, which he returns to the Merchant by other bills of exchange, to pay at *London* 20 s. ſterling for every 22 s. Flemiſh ſo taken up; how much is gain'd or loſt *per cent.* by the exchange?

Anſwer 1 *li.* 10 *s.* 9 $\frac{3}{13}$ *d. gain'd per cent. by the exchange.*

76. A Merchant in *London* delivered 200 li. ſterl. in exchange for *Paris* at 5 s. 10 d. the crown of 50 ſoulx turnois: at what price ought the crown to be return'd again to *London*, to gain there after the rate of 8 li. *per cent.* ſterling?

Anſwer; *at* 75 $\frac{3}{5}$ *d.*

77. I delivered 200 li. ſterling in *London*, to receive at *Bayon* in *Spain* for every 5 s. 10 d. there, one Ducat of 11 Ryals or 374 Merveids, which,

which, by advice, I will my Factor there so to return to *London* again by exchange, that I may thereby gain after 10 li. *per cent.* at how many merveides ought he to return the Ducats to satisfie my request?

Answer; *at* 340 *merveids.*

Of measure.

78. If 3 yards at *London* be 4 ells at *Antwerp*, and 104 ells at *Antwerp* be 300 Palmes at *Genua*; how many Palmes of *Genua* make 50 yards at *London*?

Answer $192\frac{4}{13}$ *Palme.*

79. If 45 ells at *London* be 75 ells at *Antwerp*, and 55 ells at *Antwerp* be 30 ells in *France*; how many ells of *France* make 100 ells at *London*?

Answer $90\frac{10}{11}$ *ells of France.*

80. If 10 ells Flemish make 6 ells English, and 10 ells English make 18 braces of *Venice*; how many ells Flemish make 100 braces of *Venice*?

Answer $92\frac{16}{17}$ *Flemish.*

81. If 10 ells Flem. be 6 ells Eng. and 10 ells Engl. be 18 braces of *Venice*;

nice; how many braces of *Venice* will make 100 ells Flemiſh?

Anſwer 108 *braces of Venice.*

82. If 6 ells Engliſh make 10 ells Flem. and 100 ells Flem. make 108 braces of *Venice*; how many braces of *Venice* make 100 ells Engliſh?

Anſwer 180 *braces of Venice.*

83. If 5 yards Engliſh be 4 ells Engliſh, and 13 yards Engliſh 50 Palmes of *Geanes*; how many Palms in 100 ells Engliſh?

Anſwer 480 $\frac{10}{13}$ *Palme.*

84. If 4 ells at *Antwerp* be 5 ells at *Franckford*, and 25 ells at *Frankford* 24 braces at *Lucques*; how many braces of *Lucques* are in 100 ells of *Antwerp*?

Anſwer 120 *braces of Lucques.*

85. If 4 ells at *Antwerp* be 5 ells at *Frankford*, & 25 ells of *Frankford* 24 braces of *Lucques*; how many ells of *Antwerp* in 100 braces of *Lucques*?

Anſwer 83 $\frac{1}{3}$ *ells of Antwerp.*

86. If 4 ells at *Antwerp* make 3 yards

yards at *London*, and 15 yards at *London* 12 els at *Lyons*; how many ells of *Antwerp* in 60 ells of *Lyons*?

Answer 100 *ells of Antwerp.*

87. How many yards of *London* make 27 ells at *Antw.* when 100 ells of *Antwerp* make 60 ells of *Lyons*, and 20 ells of *Lyons* make 25 yards of *London*?

Ans. 20 $\frac{1}{4}$ *yard of London.*

88. If 35 ells of *Vienna* make 24 at *Lyons*, and 3 ells of *Lyons* 5 ells of *Antwerp*, and 100 ells of *Antwerp* 125 ells of *Frankfort*; how many ells of *Frankford* make 42 $\frac{1}{4}$ ells at *Vienna*?

Answer 60 $\frac{5}{14}$ *ells of Frankfort.*

Of weights

89. If 112 lb. English be 98 lb. at *Rouan*, and 100 lb. at *Rouan* 112 lb. at *Syvil*; how many lb. English make 100 lb. at *Syvil*?

Answer 102 $\frac{2}{49}$ *lb.*

90. If 112 lb. English be 98 lb. at *Rouan*, and 100 lb. at *Rouan* 112 lb. at *Syvil*; how many pound at

Syvil

Syvil make 112 lb. Engliſh?

Anſwer 109 $\frac{19}{25}$ *lb.*

91. If 26 lb. Engliſh make 25 lb. Flemiſh, and 25 lb. Flemiſh 29 lb. at *Rochel*, how much Engliſh weight in 100 *Rochel*?

Anſwer 89 $\frac{19}{29}$ *lb.*

92. If 26 lb. Engl. be 25 lb. Flem. and 25 lb. Flem. be 29 lb. at *Rochel*; how many lb. *Rochell* in 112 Engl.

Anſwer 124 $\frac{12}{13}$ *lb.*

Equation of Payments.

I. *THis Rule aims at the reducing of many particular payments to an intire one, viz.*

A Merchant owing 500 li. to pay 300 li. at 4 moneths, 100 li. at 6 moneths,

and 100.l. at 12 moneths, agrees to discharge the debt at one payment: Now the Question is, at what time that payment ought to be made, without damage to Debtor or Creditor, monie being estimated at 6 l. *per cent. per an.*

II. *As the aggregate of the particular sums of monie is to the aggregate of the products arising from the multiplication of each particular sum of monie by its respective time, so is* 1 *or unity to the mean time to be assigned for an intire payment:* Or, which is all one, and more familiar to the learner, *Multiply each sum into its particular time, and divide the aggregate of the products by the aggregate of the severall sums payable, and the quotient declares the time of payment.* So the answer to this question will be found 6 moneths, *viz.*

300 x 4 = 1200
100 x 6 = 0600
100 x 12 = 1200
5)30(6 *moneths.*

Now

Now the following operations evidence this Rule erroneous; For in the payment of 500 *l. prout supra*, there will be found 2 *s.* 2 *d. proximè* losse to the Creditor, *viz.*

mo. li.	*mo. li.*			
12.	6 ::	4.	2.	
12.	6 ::	6.	3.	
12.	6 ::	12.	6.	
li.	*li.*	*li.*	*li.*	*s. d.*
102.	100 ::	300.	294.	2. 4. *&c.*
103.	100 ::	100.	097.	1. 8. *&c.*
106.	100 ::	100.	094.	6. 9. *&c.*
			485.	10. 9. *&c.*

Then for tryall

mo. li.	*mo. li.*	*s.*	*d.*	
12.	6 ::	6.	3.	0. 0.
li.				
103.	100 ::	500.	485.	8. 8. *&c.*

Then,

li.	*s.*	*d.*	*li.*	*s.*	*d.*	*s.*	*d.*
485.	10.	9. *&c.*	— 485.	8.	8. *&c.*	= 2.	2.

proximè, which is loſt to the Creditor, by relying upon this Rule, and receiving his monie at 6 moneths. If the rate of Intereſt had been 8 li. *per cent.* the loſs would have been 5 s. 4 d. *proximè*.

If 6000 l. to be paid, *viz.* 4000 li. at nine moneths, and 2000 l. at ſix moneths were to be paid at an intire payment, accounting intereſt at 8 li. *per cent.* the rule of Equation would limit that payment to 8 moneths, which would be 9 s. 2 d. *proximè* loſſe to the Creditor.

In annual payments the loſs is far greater, as in *Wingate* 279. 281, where, by relying upon this Rule in the payment of 100 li. annually, for 5 years (Intereſt going at 6 li. *per cent.*) the Creditor loſeth 2 li. 4 s. 2 d $\frac{3}{4}$. *proximè*, whereby it is evident, the loſs will be more or leſs, as the rate of intereſt doth differ.

MVSEVM BRITANNICVM

FINIS.

Errata.

PAge 9. line 24. for the 5. Rule of the 2. and 3. Chap. read, the 6. Rule of the second, and 5. Rule of the 3. chap. p. 11. l. 16. for pears r. appears, p. 13. l. 22. for second r. first, p. 14. l. 3 for 3. r. 2. p. 24. l. 8 for 3. r. 2. l. 17. dele 10 s. p. 27. l. 14. for 6 r. 5. p. 28. l. 18 for 103. r. 102. p. 41. l. 14. draw a lyne under 54, and omit the lyne drawn under 18256 p. 64. l. 12. dele $\frac{1}{3}$ p. 74. in the margent, for chap. 10. r. chap. 11. p. 80. l. 8. for 2 hh. r. 3 hh. l. 13. for 494. r. 594. p 100 in the margent, for chap. 7. r. chap. 10. page 203. line 7. for 55. read 5, 5, page 106. in the second answer, for 1 s. r. 19 s. p. 108. in the answer, for 3 d. r. 6 d. p. 109. l. 12. for 7 lb. r. 14 lb l. 13. dele 21 lb. p. 119. l. 6. for 48. r. 84. p. 128 l. 14. for $\frac{1}{5}$ r. $\frac{1}{15}$ p. 135. l. 14. for first r. third, l. 15. for third r first, l. 16. for numerator r. denominator p. 151. l. 7. for 780. r. 789. p. 155. in the answer, for 183 li. r. 383 li. and in the last line doe the like, p. 157. l. 6. for $\frac{1}{253}$ r. $\frac{17}{153}$ p. 158. l. 16. for 10 d. r. 10 li. p. 159. l. 23. for 328. r. 100. p. 171. l. 6. for 3 s. r. 5 s. p. 176. l. 9. r. the totall value, p. 181. l. 5. for yards read yard.